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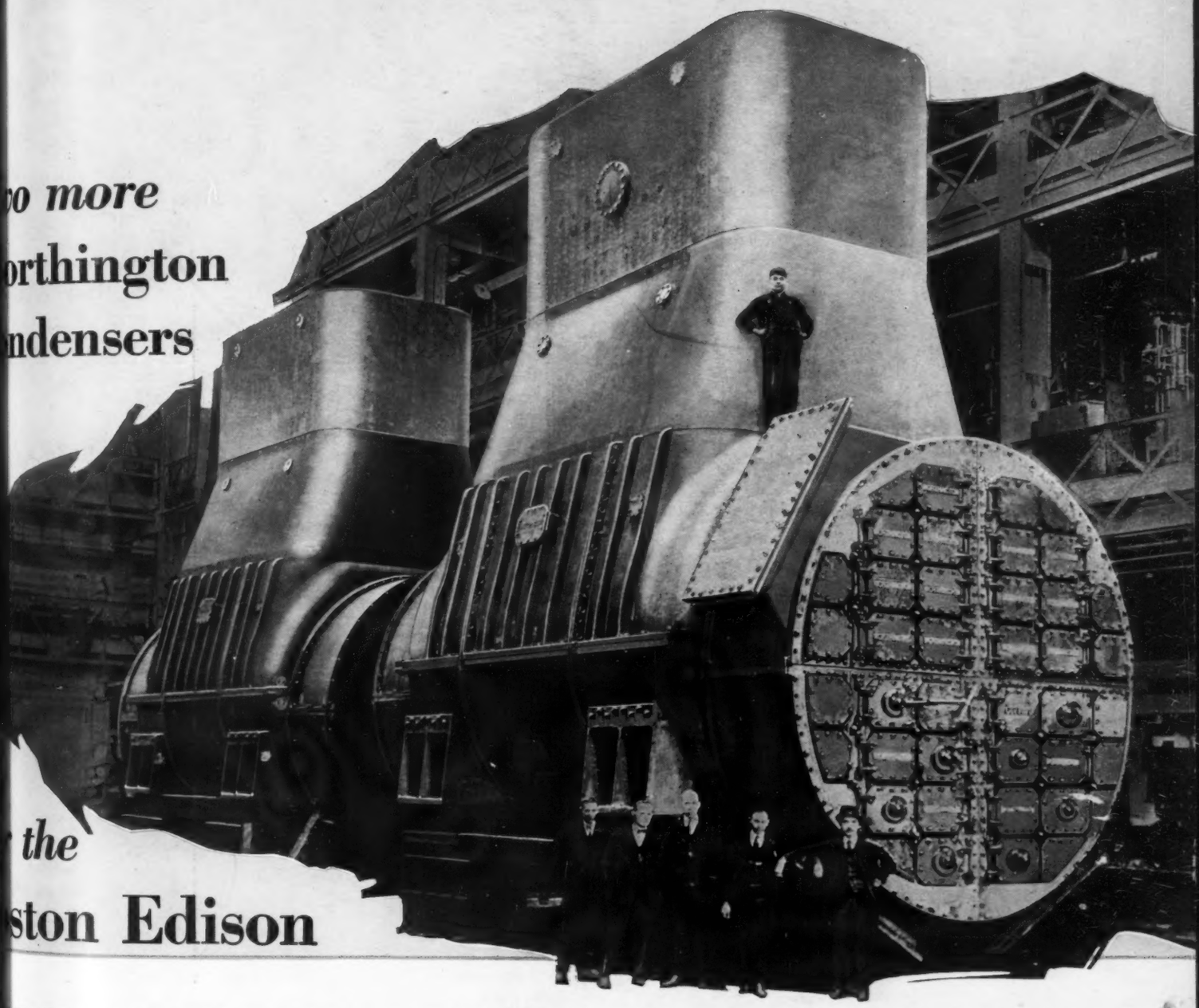

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Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD, ELECTRICAL ENGINEER AND AMERICAN ELECTRICIAN

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W. H. ONKEN, JR.

Editor

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The Convention Event of the Year

IN ANOTHER month the great event of the year, the convention of the National Electric Light Association, will be under way. This year's meeting will be held at San Francisco, and inasmuch as transportation facilities will be limited, it will be necessary for those who contemplate attending to hasten their decision. The special trains are for the most part sold out, and the regular trains are none too numerous at this season of the year.

As for the convention itself, little need be said. It is recognized as the finest held by any association in this country. No one has ever attended one without profit to himself and his company, nor has any one ever come away from one without enthusiasm for and pride in the industry represented by the National Electric Light Association. Those who cannot attend the convention will, of course, be able to read a complete account of it in that week's ELECTRICAL WORLD; but no account, however excellent, can take the place of the thing itself. One must experience the convention in order to imbibe and carry away with him the utmost of inspiration and zeal. These, together with the personal contacts made, are the things which make conventions worth while and which cause that of the National Electric Light Association to stand out so prominently among the thousands held each year in this country. This year's convention will be doubly attractive, for to the usual enthusiasm which attends the annual meeting of the N. E. L. A. will be added that gusto which only the West can supply and the attractions which abound in that section. To miss this year's convention will be missing much.

The Evolution Toward a National Electric Service

ELECTRICITY, as is well known, finds a wider application in this country than anywhere else. This is due largely to social and industrial conditions, but as General Tripp pointed out in an address at Houston, Tex., last week, it is also due to the driving force of private initiative in the United States. And while, as the chairman of the board of the Westinghouse company stated, "the developments already achieved have demonstrated that electric power is destined to recast society," there is some danger that the opportunity for wider service to humanity will be circumscribed and retarded, if not entirely perverted, by bureaucracy and governmental interference. The industry is still in the development stage, and it is chiefly because the art is far from complete that General Tripp warns against the deadening hand of government. And in doing so he is rendering a service of great value.

One has but to compare conditions of development in other parts of the world to get the full significance of the General's remarks. Europe is not lacking in culture or in scientific achievement. In fact, it possessed an abundance of both before the United States was even heard of. Why, then, should the United States surpass older nations in utilizing the discoveries of science, and why should it be so far ahead of Europe in the development and utilization of electricity? The answer as General Tripp gives it lies close to the surface. "America," he said, "took the lead largely because it did not have to overcome the inertia of governmental bureaucracy in making practical use of this new science." And so long as there are electrical secrets to be discovered, so long as the electrical art remains a fertile field for scientific imagination and investigation, so long is the government unwarranted in pursuing any other policy than that of encouraging private enterprise to utilize all its ingenuity and skill in seeking more economical ways of producing electricity and converting it into a form in which it can be used for the benefit of mankind. In a nutshell this is the gist of General Tripp's address, and it forms the basis of a sane national policy toward the electrical industry.

Following Through the "Better Home-Lighting" Contest

A FEW months ago the "better home-lighting" contest stimulated the interest of several million persons, in thousands of communities, in more and better lighting for their homes. The campaign was wisely built on educational lines, because education is sorely needed not only by the consumer but by various electrical interests. A few years ago relatively little attention was given to residence lighting, and it is gratifying to note its growth in the favor of electric light and power companies and other branches of the industry. It is desirable business, or at least it can be made so by proper development. Admittedly a crying need is interested and informed householders, but this should not blind the central-station companies, the fixture manufacturers, the contractor-dealers and others to the fact that they need a lot of educating themselves regarding the requirements and possibilities of residence lighting.

One campaign of this sort can no more bring about the millennium in home lighting than one swallow can make a summer. However, it will serve as a beginning unless its influence is permitted to die for lack of following through. Perhaps the best result of this campaign is the effect it has had on those all over the country who helped to carry it out. Many of these persons for the first time grasped some of the vital principles of better home lighting and had their eyes opened to the tremendous commercial possibilities in this ever-present and ever-expanding field. But much of the value of the campaign will be lost if the central-station companies, electrical organizations, contractor-dealers and others do not capitalize this interest before it is too late. The

word "capitalize" is used advisedly, for, regardless of the educational nature of the campaign, little or no improvement can be achieved except through the sale and purchase of the various means to that end. In other words, proper lamps, shades for bare lamps, better lighting equipment, more wiring and greater amounts of electrical energy must be purchased if home lighting is to be generally improved. The amount of this business which must be obtained in order to bring home lighting up to a conservative ideal based purely upon utilitarian requirements is enormous. A little figuring with the data available shows that there is enough business involved to make it profitable to follow through.

Scrutinize Street-Lighting Contract Economics

IT IS good to see a rising interest among progressive central-station power engineers in the profits and losses of street-lighting contracts. Too often in the past renewals have been negotiated without a real analysis of what this class of service costs a public utility to render, and too often a hit-or-miss growth of lamp installations has been allowed to take place. The National Electric Light Association is doing excellent work in this field, and it is gratifying to record that some companies are experiencing excellent cooperation from the municipalities in connection with renewals. There is no question that service prices per lamp are far below cost in not a few cases and that lamp layouts are inadequate in the extreme. Companies which lay their cards upon the table and prove their costs are finding municipal authorities disposed to meet them fairly, especially where a complete study of local street illumination and recommendations for improvement accompany the discussion of new rates. Piecemeal attacks on the problem are far less successful in winning adequate prices for service, and power engineering departments will do well to investigate the possibilities of more, better and profitable street lighting of communities *en masse* during the coming summer.

Restricting or Eliminating Direct-Current Districts

A DECIDED interest, if no marked action, is shown in various sections of the country in circumscribing the limits of direct-current service or eliminating it entirely in favor of alternating current. Total elimination is most evident in small or medium-sized towns, larger cities merely drawing in the limits of such service. The chief reasons for this tendency are the desire to avoid two kinds of service and the expense of converter substations with battery reserves and low-voltage distribution. The principal deterrents have been the lack of a substitute which has the reliability of an Edison system, the reluctance of both utility companies and their customers to scrap equipment representing a material investment and the absence of alternating-current high-speed elevator motors which have characteristics as desirable as those of direct-current motors.

Development of interconnected alternating-current network systems, such as are installed in New York City, New Orleans and Memphis, having many of the characteristics of an Edison system, has in the minds of some companies in large part abolished the first deterrent mentioned, although other companies are not so satisfied that these systems supply a completely satisfactory answer. The need of investing more capital in Edison systems to provide for growth of direct-current service has made many companies refigure the economy of scrapping the old system in favor of a new one. Considerable development in alternating-current elevator motors has made them much more attractive for high-lift service such as is found in direct-current districts.

Where an electric service company has satisfied itself of the desirability of substituting alternating current for direct current, the chief obstacle remaining is that of inducing the consumers to accept the new service. This is being met with more or less success in various communities in different ways, although the same policy is applied to every one in the same community. Among the methods which have been brought to attention are: (1) Refusing direct-current service to new customers; (2) increasing direct-current rates or decreasing alternating-current rates to establish a differential; (3) refusing to increase direct-current service facilities and offering alternating current as more reliable; (4) inducing customers to install converting equipment (motor-generators, converters or rectifiers); (5) helping customers dispose of old direct-current equipment, and (6) sharing expense of conversion or substitution.

The method thought to be best, whatever it may be, should be applied only after the larger users of direct current have been called into conference with the utility to have the need of a change explained and the best methods of effecting it discussed. Then approval by the commission, if this be necessary, will be more likely to meet with public approval. At least such procedure helped considerably during the war, when industrial rates had to be increased.

Field of Air-Break Switches Depends on Ingenuity of Manufacture

AIR-BREAK switches are being installed for voltages up to the highest in commercial operation. While they are being used mostly to isolate circuits or apparatus, at least one company is using them to break loads of 1,300 kw. at 33 kv. in order to economize in the cost of switching equipment. Experiments have been made by another company to break loads on a large system operating at 110,000 volts with very satisfactory results, it is reported, but no performance data have been made available.

Although some air-break switches are available which overcome the various causes of trouble first experienced with this type, general improvement has not included all equipment. Some motor-operated switches are reported to have given trouble due to temperature changes affecting the mechanical adjustments, and some companies have reported the need of larger motors on some of the more massive air-break switches. Difficulty in aligning some independent-pole, gang-operated switches has also occurred, apparently due to strains in the supporting structure. Sleet is still hindering the operation of some switches, although various ingenious schemes have minimized this trouble with others.

The switch which can be readily installed and aligned, will not freeze open or shut, is not seriously affected by temperature changes, will not flash over from phase to phase when opening, cannot easily get out of alignment and does not require too many insulators is the

one which will command attention. If these features can be all obtained at a nominal expense and modification can be made which can be relied upon to break load currents, it is quite likely that there will be even more demands for air-break switches where flexible switching arrangements are desired without too great an investment.

At present, however, it appears that the average air-break switch is limited chiefly to a non-load-breaking isolating function. Gang and motor operation has greatly facilitated its use, and signs are seen of the switches being made more generally automatic, this not being a difficult problem.

Personnel Problems at the Front

DEEPLY significant of the broadening vision and wider responsibilities of the engineer was last week's regional convention of the A. I. E. E. at Swampscott, Mass. It is no new thing for technical education to compete with engineering technique for the interest of Institute audiences, but all through the varied sessions of the Northeastern meeting the close observer of trends in professional thinking was aware of a powerful undercurrent of human interest which is full of encouragement toward still better things to come. In brief, personnel problems have reached the front rank of importance in relation to the development of the electrical industry as cross-sectioned in an A. I. E. E. convention.

Progress in laboratory, in curriculum, in workshop, plant and sales field is more dependent upon personnel than upon anything else. It is noteworthy that a good number of young and highly competent specialists contributed papers of marked quality and real achievement to these sessions. Not many years ago men of this age would have lacked the experience and the support necessary to enable them to speak with so much authority upon methods of eliminating operating troubles, improvements in apparatus design, progress in instrument development, the art of cable manufacture—for it is an art, if not yet a full-grown science—and advances in the measurement and photography of almost inconceivably rapid changes in wave magnitude, throwing direct light upon flashovers, lightning, transients, needle-gap time lags and other elusive phenomena. Youth as well as years is enlisted in the battle of insulation against rising voltages, and it keeps its gains! Here is real evidence that money expended for research brings forth yield a hundredfold under the stimuli of recognized incentive, sound organization, free co-operation and professional recognition.

Gratifying as it is to observe these results of a liberal policy in training specialists under favorable conditions and encouraging them to "say their say" on the convention floor, it is equally heartening to note the attention now being paid to the education of the subordinate officers and the rank and file of the electrical army. Co-operative courses between the engineering colleges and industry are being administered with keen understanding of needs at both ends of the educational tie line. Testimony at Swampscott by students taking such courses strengthens the impression that this work must go forward on a larger scale in the future, with increasing benefits to industry and to the schools. Still further along the line, the educational training now offered to the personnel in innumerable corporations declares the sunrise of a new day in relations with employees. Hand in hand the technical and personnel problems of the future will be solved by engineers or by men of engineering viewpoint, thus insuring well-rounded progress and that contentment in work which is one of the greatest joys of life.

A Challenge from Industrial Gas Fuel

IT HAS been announced that the Massachusetts Institute of Technology is about to establish a graduate course in the industrial applications of gas fuel. In this connection the statement appears that a recent survey of the city of Rochester, taken as a typical industrial community, shows that while the consumption of electricity has increased 120 per cent in the last ten years, the use of gas has increased 170 per cent. Meanwhile manufacturers of gas-fuel equipment are very energetically promoting the gas-fuel idea, admitting that the electric furnace has been extensively successful in displacing the gas-fired furnace in the past, but claiming that because of improvements in gas equipment electricity has no justification today as an industrial fuel. "Whatever has been accomplished in the past with the electric furnace can now be done with gas—with three times the economy in fuel cost and the same accuracy of control," according to one company's statement.

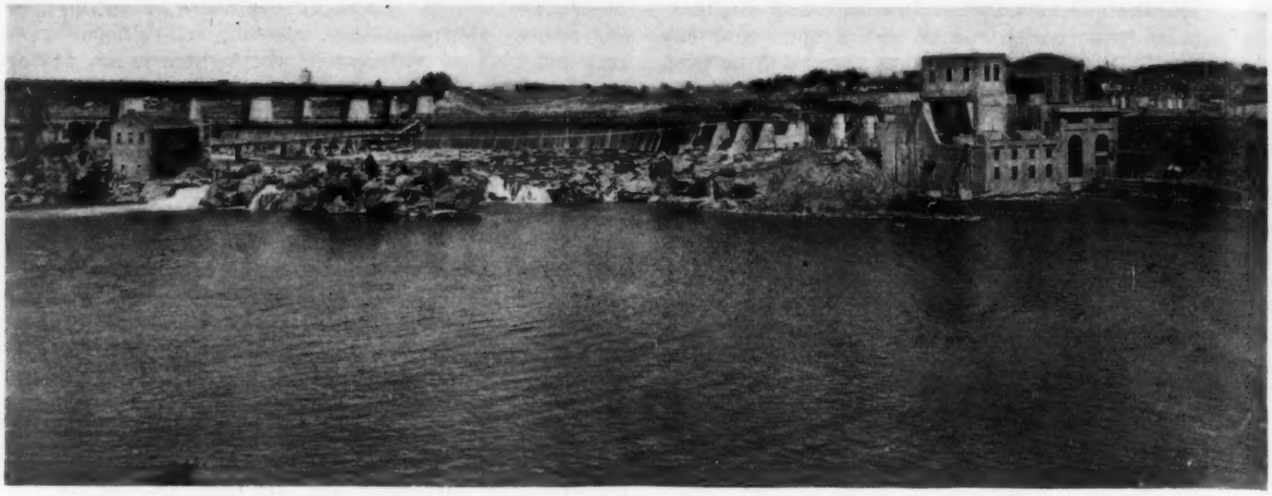
All this is certainly a challenge to the central-station industry—not because these statements need be taken as literally true, but because they mark the awakening of a more energetic and effective competition. The advantages of electric heat in industrial processes remain unchanged, but the conditions under which the selling will be done are apparently to be more difficult. And the increased zeal and effectiveness of the gas man's work can only be met by equal or superior skill in salesmanship.

With the improved efficiency of gas-fuel applications to reckon with, there are only two resources which the central-station industrial fuel man may tap for the strengthening of his selling efforts—education and training. Fortunately both are easily obtainable through the industrial heating courses which for several years have been maintained by both the General Electric and Westinghouse companies at their factories. Unfortunately, however, these courses have been very poorly supported, although the N. E. L. A. committee on industrial heating has given generously of time and effort in endeavoring to interest central-station executives in the desirability of sending men for instruction that would fit them for the development of this profitable load.

Although a considerable number of men have taken the course, members of the committee frankly admit that the results are discouraging. Many companies are apathetic on the subject, although a fallow field for industrial heating lies waiting. There are many cases, also, where permission has been given to power men to enter the school and they have not had sufficient interest and enthusiasm to take two weeks at Mansfield or Schenectady and find out what it was all about.

But the matter will not wait in the face of the strengthening activity in the gas field. If industrial heating is to be done electrically, then energetic measures should be taken to develop the load now. Those who let the gas man put modern gas-fuel equipment into general local use will find the selling very much more difficult and expensive later on.

Outdoor Generating Plant on the Snake River at American Falls, Idaho



INTERESTING among the recently completed hydro-electric plants of the West is the outdoor generating plant of the Idaho Power Company on the Snake River at American Falls, Idaho. Two 6,000-kw. units were installed in 1924 and are of the outdoor type.

The accompanying illustrations show the new section and an older part of the plant containing one 3,000-kw. machine fully housed in the customary manner. All high-tension equipment is of the outdoor type. Outgoing transmission lines operate at 44 kv. The plant is tied in with the system of the Utah Power & Light Company and is ordinarily operated at approximately 100 per cent load factor.

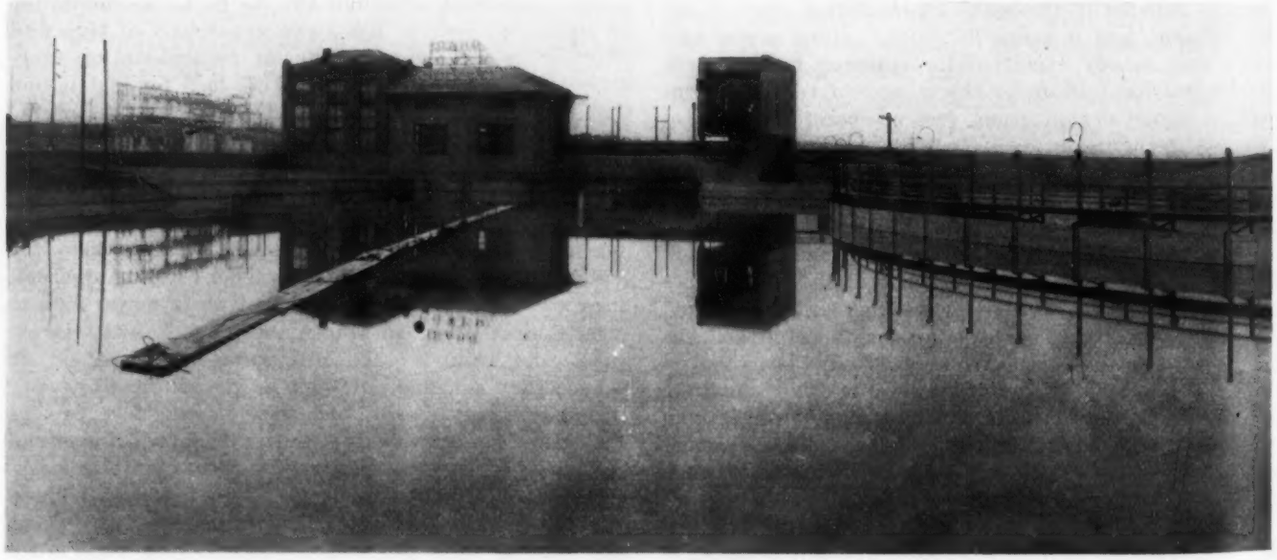


FIG. 1—TENSION AND LENGTH OF PULL MEASURED SIMULTANEOUSLY

Cable-Pulling Tensions

Tests with Different-Size Cables and Conduits of Different Materials, Sizes and Curvatures Indicate Greater Distance May Be Allowed Between Manholes

By WILL G. KELLEY
Assistant Engineer of Distribution, Commonwealth Edison Company

FIG. 2—FLEXIBLE TUBE EMPLOYED TO FACILITATE FEEDING CABLES INTO DUCT

THE tension required to pull a lead-covered insulated cable into an underground conduit has a very important bearing upon the design of the conduit system as it affects the allowable curvature, the distance between manholes and the diameter of conduit. The general practice in the United States for the installation of underground cables is to build a conduit system with manholes of sufficient size to provide for joining the adjacent sections of the cable after they had been placed in the conduit. In order to prevent injury to the cable it is important that the tension placed upon it during installation shall not exceed its safe strength.

To determine the tension in different sizes of cable for various sizes of conduit and forms of curvature, an experimental section of conduit was built, having predetermined size and curvature, as shown in Fig. 3. The conduit consisted of 3½-in. fiber, 3½-in. stone and 4-in. stone. The fiber was composed of the ordinary commercial wood pulp impregnated with a tar derivative and surrounded by concrete. The stone conduit was made of concrete having sections 3 ft. in length, with an inside diameter as specified above. The configuration of the conduit varied from straight to curved, with a maximum offset of 20 ft. In addition to the long gradual curves, several conduits were constructed with short bends such as might occur where a small deviation was necessary to avoid a water or gas pipe.

In addition to the tests made in the experimental conduit line, a number of tests were made upon actual sections of conduit varying in length from 290 ft. to 465 ft. The cables used in the tests included four-conductor, No. 0, of 1⅝-in. diameter; three-conductor, 500,000 circ.mil, of 2½-in. diameter; three-conductor, 500,000 circ.mil, of 2 1/16-in. diameter; two-conductor, 1,500,000 circ.mil, of 2⅞-in. diameter, and three-conductor, 350,000 circ.mil, of 3-in. diameter. To facilitate proper entrance of the cable into the conduit it was fed through a flexible tube, as shown in Fig. 2.

In making the tests the cable reel was placed at one end of the conduit line and a truck equipped with a winch was placed a sufficient distance from the other end of the conduit line to provide for the travel of the pulling rope. A steel-pulling rope was passed through the conduit to pulleys as shown in Fig. 12. By a dynamometer inserted in the pulling rope near the manhole measurements of tension were taken every 5 ft. or 10 ft. as the cable entered the conduit. To obtain the readings at proper intervals a steel tape was fastened to and allowed to follow the dynamometer. An observer at the manhole signaled as every 5 ft. of the tape unrolled. The dynamometer and method of taking the readings are illustrated in Fig. 1.

Records were kept of each individual test, a sample being shown in the table. From such readings shot-gun diagrams were made for each test, through the points of which a smooth curve was drawn, as shown in Fig. 5.

Comparative tensions in various sizes of cable are given in Fig. 6 for the straight sections of the experimental conduit. It will be noted that, starting with a high initial tension, there is a gradual increase as the cable enters the conduit. The initial tension is composed of the force necessary to unreel the cable and straighten it out preparatory to entering the duct plus the friction of the pulling rope in the conduit and over the pulleys. This initial tension will remain fairly constant throughout the test, there probably being a slight decrease as the pulling rope leaves the conduit.

SAMPLE OF RECORDS KEPT FOR PLOTTING CURVES

Length of Cable in Conduit	Tension in Pounds	Length of Cable in Conduit	Tension in Pounds	Length of Cable in Conduit	Tension in Pounds	Length of Cable in Conduit	Tension in Pound
0	1,000	100	1,400	200	2,200	300	3,300
5	1,000	105	1,500	205	2,300	305	3,300
10	800	110	1,300	210	2,300	310	3,300
15	600	115	1,400	215	2,350	315	3,400
20	1,000	120	1,500	220	2,500	320	3,500
25	1,000	125	1,500	225	2,500	325	3,400
30	700	130	1,500	230	2,500	330	3,500
35	700	135	1,500	235	2,600	335	3,600
40	1,300	140	1,700	240	2,700	340	3,500
45	1,000	145	1,700	245	2,700	345	3,700
50	1,000	150	1,800	250	2,700	350	3,800
55	800	155	1,500	255	2,800	355	3,900
60	1,300	160	1,800	260	2,900	360	4,000
65	1,000	165	1,900	265	2,900	365	4,000
70	1,000	170	2,000	270	3,000	370	4,000
75	1,000	175	2,100	275	3,000	375	3,900
80	1,100	180	2,100	280	2,900	380	4,000
85	1,100	185	2,100	285	3,000	383	4,000
90	1,100	190	2,100	290	3,200	...	....
95	1,400	195	2,200	295	3,300	...	8

The tensions obtained in pulling the one size of cable into 3½-in. stone conduit having different amounts of curvature are shown in Fig. 7. In this case the tension is made up of two major components, the first due to the tension in a straight duct of equal length and the second due to the curvature in the section. The tension due to the curvature will be superimposed upon the tension for a straight conduit line. In comparing these curves it will be noted that the larger the offset the greater the tension. It is rather interesting to note that the tensions decrease after the cable has passed around the main portion of the bend. The exact reason for this has not been determined, but it may be due to the fact that the pulling rope has left the curved portion of the duct or that the passage of the first few feet of cable around the curve has smoothed out any obstructions.

To pull various sizes of cable around short bends the tensions required are as shown in Fig. 8. These

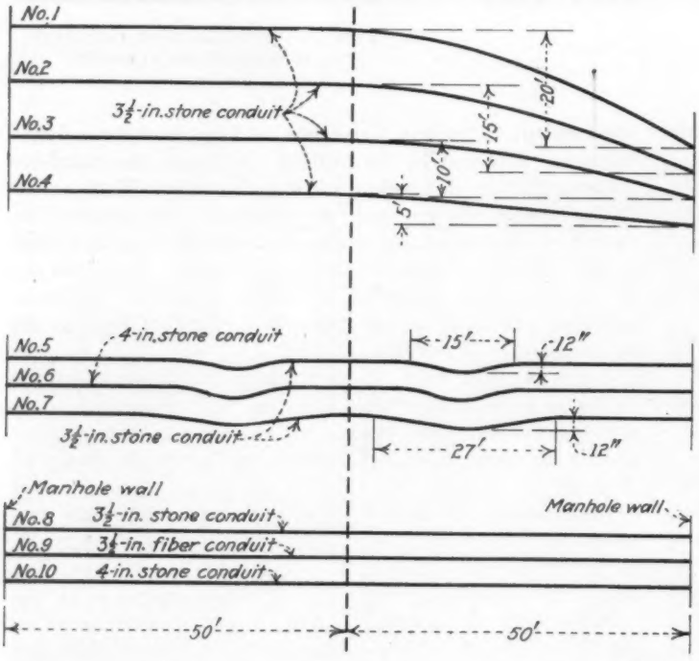
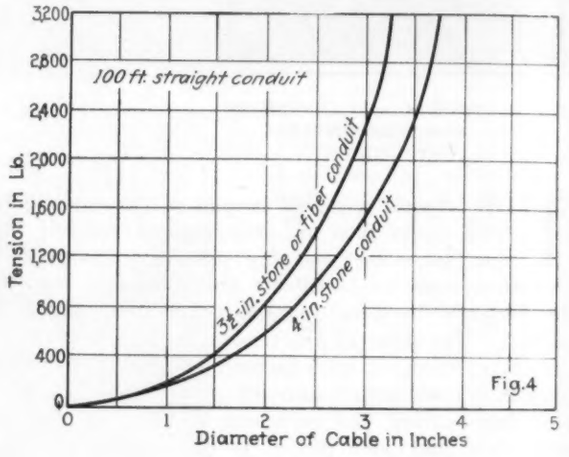


Fig. 3



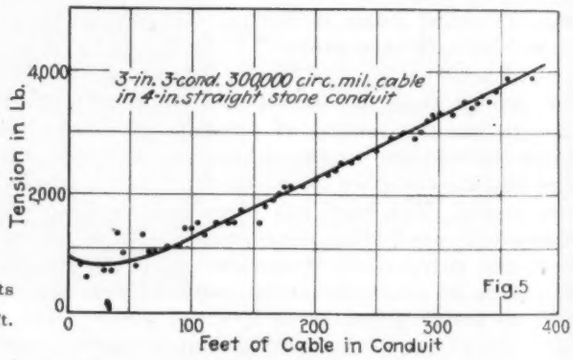


Fig. 3—Layout of experimental conduit in which cable tension tests were made.
Fig. 4—Relation between diameter of cable and tension for 100-ft. straight conduit.
Fig. 5—Method of obtaining curves.

FIGS. 3 TO 5—METHOD OF LAYING OUT CONDUIT AND PLOTTING OF TEST RESULTS

curves in general follow the characteristics of the tension curves in Fig. 7. Curves 1 and 2 apply to cables only ⅛ in. smaller in diameter than the conduit. The effect upon the tension here is much more pronounced than in curves 3, 4 and 5, where the difference between the diameter of the cable and the conduit is 1 in. or more. It is also apparent that the short bend covered by curve 1 increases the tension over the long bend for the same size of cable.

The tensions required to pull 3-in. cable in straight conduit sections of 3½ in. and 4 in. inside diameter are illustrated in Fig. 9, the length of the conduit being from 290 ft. to 465 ft. The reduced tension in 4-in. duct compared with 3½-in. duct is apparent from these curves.

For the same length of conduit and same size of cable the initial and final tensions vary considerably, owing to obstructions or the presence of moist clay which acts as a lubricant. This variation is more pronounced in the tests shown in Fig. 9 than in those shown in Fig. 6, the conduits used in Fig. 6 having been laid very carefully for experimental purposes. Where the inside diameter of the duct approaches the size of the cable, the effect of any obstructions in the duct will be more apparent. Such obstructions occur quite often and are due to poor alignment at the joints, slightly reduced diameter, elliptical shape of conduit, or foreign matter which has entered and lodged in the duct. The sharp rise near the end of the pull on curve No. 1, Fig. 9, is undoubtedly due to some one of the foregoing conditions.

The effect of a bad joint between two adjacent pieces of conduit is shown by Fig. 10. The two sections not having been in proper alignment provided a sharp shoulder over which the cable was pulled. The tension due to this defect in the conduit line was in this case approximately equal to the tension which would have been required to pull the cable in a straight, smooth duct of equal length. This means that the tension has been increased 100 per cent by the poor joint in the duct section.

The tension required to pull 3-in. cable through a vertically curved length of conduit compared to tension of straight duct for approximately the same length is represented in Fig. 11. In this case the curvature was in a vertical plane instead of a horizontal plane, as covered by the curves on Fig. 7, and the tension was reduced below the tension for a straight conduit section rather than increased. This reduction of pulling tensions is due to the fact that where a curve has its center depressed the pull on the cable tends to lift it off the conduit and decrease the tension required.

From the results obtained in the foregoing tests the two curves shown in Fig. 4 were prepared to show

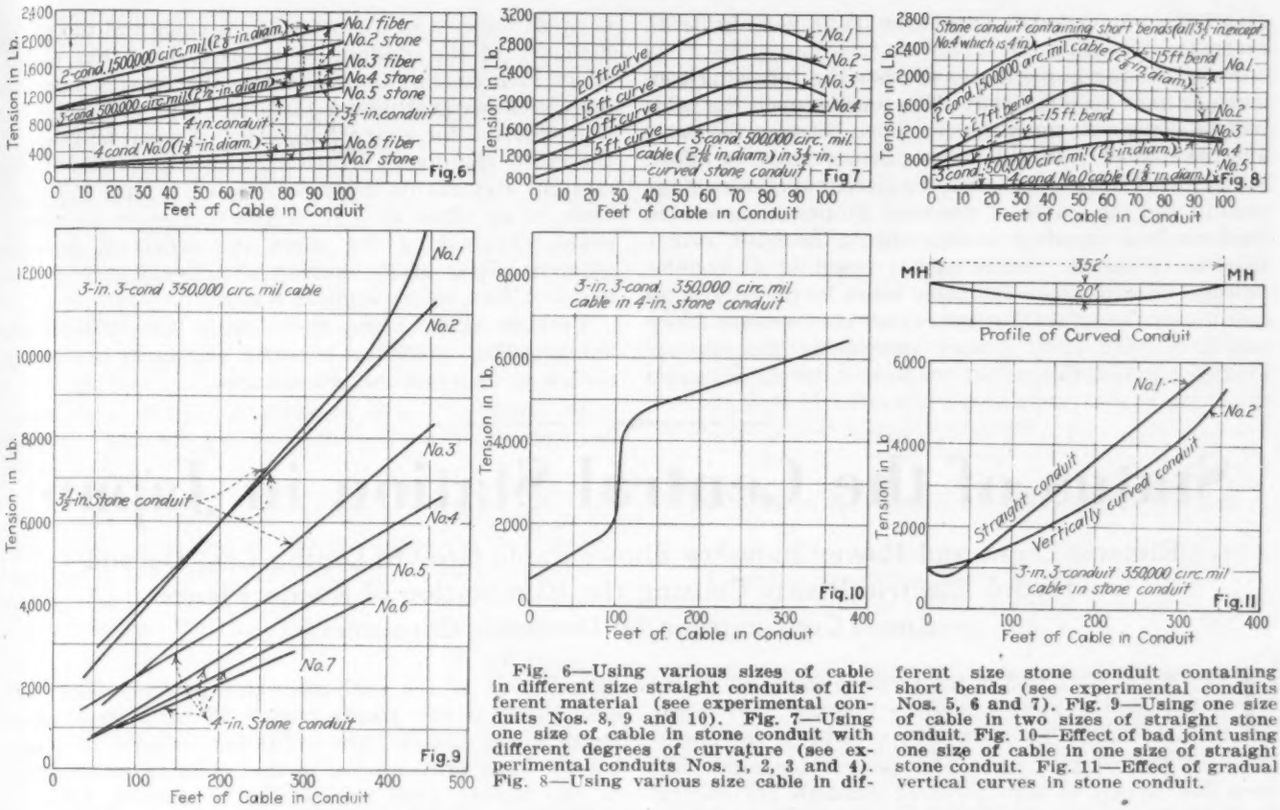


Fig. 6—Using various sizes of cable in different size straight conduits of different material (see experimental conduits Nos. 8, 9 and 10). Fig. 7—Using one size of cable in stone conduit with different degrees of curvature (see experimental conduits Nos. 1, 2, 3 and 4). Fig. 8—Using various size cable in different size stone conduit containing short bends (see experimental conduits Nos. 5, 6 and 7). Fig. 9—Using one size of cable in two sizes of straight stone conduit. Fig. 10—Effect of bad joint using one size of cable in one size of straight stone conduit. Fig. 11—Effect of gradual vertical curves in stone conduit.

FIGS. 6 TO 11—CABLE-PULLING TENSIONS REQUIRED UNDER DIFFERENT CONDITIONS

the effect upon the tension of various sizes of cable for the same size of conduit. Curve No. 1 represents data for a 3½-in. conduit and curve No. 2 for a 4-in. conduit. These curves will pass through zero tension when the size of the cable is zero and will approach infinity as the size of the cable approaches the size of the conduit.

From the data compiled it was then proposed that some determination should be made of the maximum length of the conduit between manholes which could be built for straight or curved sections of conduit having various amounts of offset. The allowable tension in the cable was placed at one-third the tensile strength of the copper conductors, with a maximum pull of 8,500 lb. for large sizes. The maximum of 8,500 lb. was used because this is the tension at which the pulling truck would skid unless special means were provided for anchoring it. The maximum lengths for two sizes of conduit and various sizes of cable in straight sections are given in Fig. 13. The maximum allowable length of conduit between manholes for curved sections of conduit of 3½-in. and 4-in. inside diameter is shown in Figs. 14 and 15. The allowable tension in the cable for these curves is the same as that used in calculating length of straight sections. The amount of curvature

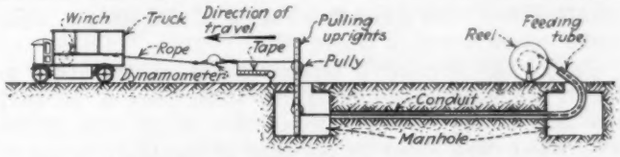


FIG. 12—ARRANGEMENT OF APPARATUS DURING TEST

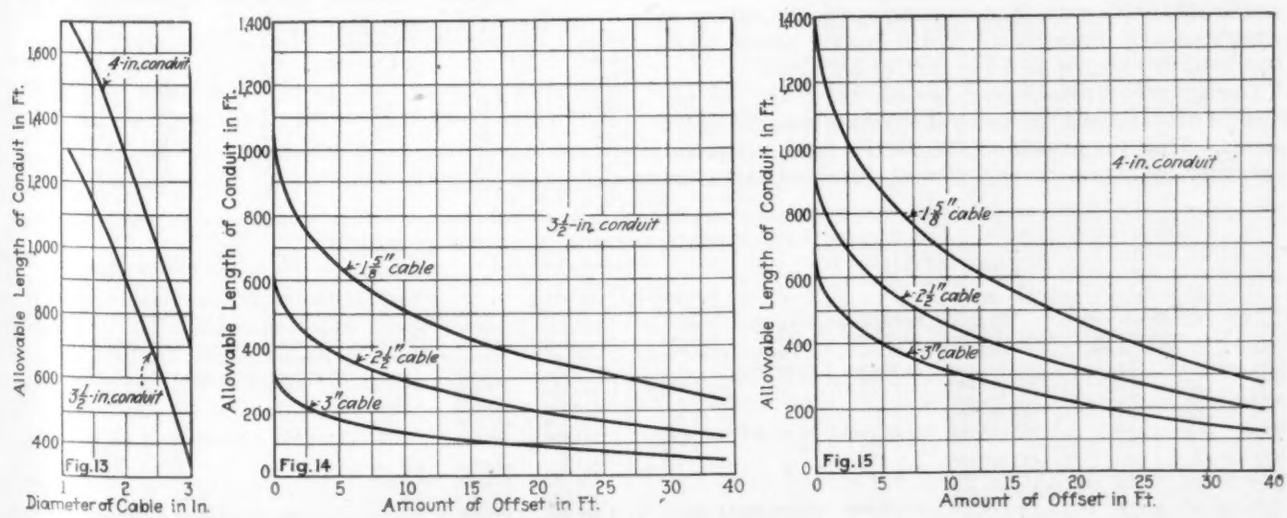


FIG. 13—ALLOWABLE LENGTH OF STRAIGHT CONDUIT FOR VARIOUS SIZES OF CABLE. FIGS. 14 AND 15—ALLOWABLE LENGTHS OF CURVED CONDUIT FOR THREE SIZES OF CABLE

or offset in the conduit line varies from zero to 34 ft. under these conditions.

From the foregoing series of tests the following conclusions have been derived: The tension upon the cable will be dependent upon the clearance between the cable and the conduit wall, the amount of curvature or offset, the angle of deflection between adjacent sections of the conduit and the length of the run. In providing curved sections long, gradual curves should be built rather than short curves. Short curves result in a shoulder or edge around which the cable must be pulled and an opening at the joints through which the concrete filling may enter and form a burr, decreasing the internal diameter. A difference of at least 1 in. is advisable between the outside diameter of the cable and the inside diameter of the conduit. The tests show that a 5-ft. offset in a conduit line increases the tension approximately 65 per cent, and a 15-ft. offset 92 per cent, over that required for a straight section of equal length. If, therefore, the distance between manholes is 660 ft. for straight sections, it must be reduced to 400 ft. where there is an offset of 5 ft. if the tension is to remain equal. In making the offset the deflection between adjacent pieces of the conduit should not exceed 1 in. per duct foot, or an angle of 5 deg.

Further study along these lines will undoubtedly aid operating companies to arrive at a more economical design of underground construction.

Status of the Central Station in Japan

Electric Light and Power Industry Shows Rapid Growth During Last Decade —Hydro-Electric Plants Causing the Elimination of Steam Plants —Small Consumption by Domestic Consumers

JAPAN has been well in the front in the development of her electric light and power industry. As in the United States, the marvelous growth in the operations of the electric light and power companies has been due largely to the increased demands for electric light in the home and city, increased power requirements for industry, increased electric transportation facilities and the development of the water powers of Japan.

According to data furnished by Baron Ishimoto, there were 699 electric light and power companies operating in Japan in December, 1921. The prime-mover rating of the generating plants of these companies totaled 1,254,000 hp. The installed generator rating in 1907 was 74,400 kw., which had increased in April, 1921, to 739,600 kw., an increase of nearly tenfold. In addition, plants with a total generator rating of 666,400 kw. were under construction in April, 1921.

Japan has devoted a large amount of attention to the development of her extensive water powers. In 1907 the total rating of the hydro-electric plants was 25,700 kw., which was about 34 per cent of the total rating of all the electric generating plants in the country. In April, 1921, this ratio had been reversed, the rating of completed and uncompleted hydro-electric plants totaling 1,062,000 kw., or 75.5 per cent of all plants.

During the fourteen-year period, therefore, 78 per cent of the increase in generator rating was in hydro plants. Thus the growth of the electric light and power industry in Japan became almost identical with the development of the nation's water powers. Not only have steam-power plants ceased to be a dominating factor in the electric light and power industry of Japan, but the high price of coal in that country has resulted in the almost total annihilation of steam drive in industry as a whole.

Considerably more than half of the electric generating plants of Japan have a total generator rating of under 50 kw. During the period from 1912 to 1921 almost two thousand of these small plants were constructed. In April, 1921, there were 4,323 generating plants, or an increase of 2,968 during the nine years from 1912 to 1921.

Although in 1921 there were 6,986,000 electrically lighted homes in Japan, only about two million less than in the United States, yet the consumption of energy per home was strikingly below the consumption in the average American home. The average Japanese house

TABLE II—DIVIDEND RATES MAINTAINED BY ELECTRIC ENTERPRISES IN JAPAN

Year	Number of Companies Paying 15 Per Cent or More	Number of Companies Paying 12 Per Cent or More	Number of Companies Which Paid Less Than 5 Per Cent	Number of Companies Paying No Dividend	Number of Companies Reporting a Deficit
1912.....	9	52	15	32	12
1913.....	7	74	20	45	20
1914.....	6	92	25	48	21
1915.....	11	106	33	60	18
1916.....	13	121	20	65	18
1917.....	33	118	9	46	20
1918.....	40	129	20	50	21
1919.....	58	130	9	47	26
1920.....	49	122	23	62	39

TABLE I—GROWTH OF THE ELECTRICAL INDUSTRY IN JAPAN

Year	Total Number of Operating Companies	Total Capitalization (Yen)	Total Gross Revenue (Yen)	Total Net Profit (Yen)	Ratio of Profit to Paid-Up Capital (Per Cent)	Installed Generator Ratings (Kw.) Total	Steam-Electric Plants	Hydro-Electric Plants	Number of Electrically Lighted Houses	Number of Electric Lamps in Use	Average Number of Lamps for Home	Average Wattage Consumption per Wired Home
1912.....	282	373,500,000	58,500,000	22,000,000	8.3	462,000	229,000	233,000	1,565,000	4,095,000	2.6	46.7
1913.....	377	500,000,000	.....	.....	....	597,000	275,000	322,000	.....	.....	...	....
1914.....	435	578,200,000	.....	.....	....	716,000	367,000	349,000	.....	.....	...	....
1915.....	481	594,700,000	.....	.....	....	772,000	431,000	341,000	.....	.....	...	....
1916.....	514	633,700,000	116,000,000	47,200,000	9.4	805,000	445,000	360,000	3,744,000	9,035,000	2.4	48.5
1917.....	529	704,500,000	.....	.....	....	875,000	418,000	457,000	.....	.....	...	....
1918.....	546	788,500,000	.....	.....	....	984,000	395,000	589,000	.....	.....	...	....
1919.....	579	1,063,900,000	.....	.....	....	1,133,000	333,000	800,000	.....	.....	...	....
1920.....	614	1,341,500,000	351,500,000	118,200,000	12.5	1,378,000	553,000	825,000	6,986,000	18,114,000	2.6	75.5
1921.....	699	1,765,000,000	.....	.....	....	1,527,000	612,000	915,000	.....	.....	...	....

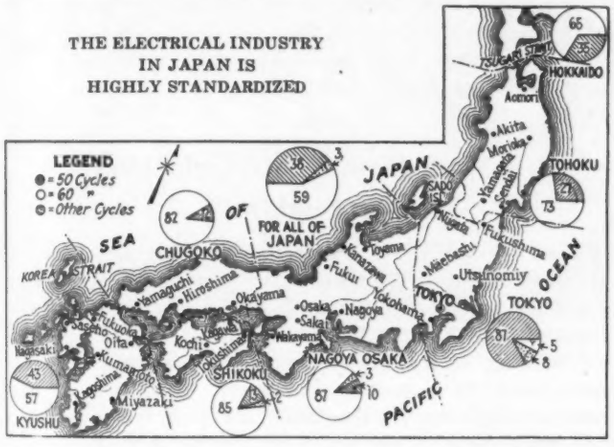
TABLE III—CLASSIFICATION OF GENERATING PLANTS IN JAPAN ACCORDING TO TOTAL RATING OF INSTALLED GENERATORS

Size of Plants	Number of Generating Plants 1912	1921	Increase 1912-1921
Less than 50 kw.	800	2,783	1,983
From 50 kw. to 100 kw.	160	328	166
From 100 kw. to 500 kw.	224	646	422
From 500 kw. to 1,000 kw.	70	158	88
From 1,000 kw to 5,000 kw.	83	312	229
From 5,000 kw. to 10,000 kw.	8	51	43
More than 10,000 kw.	9	46	37
Total generating plants	1,356	4,323	2,968

contains only 2.6 electric lamps, and the average wattage consumption per home is only 75.5. The average American home, on the other hand, contains 22 electric lamps, with a total wattage of 880, or almost twelve times the wattage consumption in the average Japanese home.

Financial expansion has accompanied the growth in the volume of production. This is a fact not only in the aggregate capitalization of the industry, but in the investment per operating company. The total capitalization in 1921 was 1,765,000,000 yen, equivalent to approximately $883,000,000 at the normal rate of exchange. The total investment in the electric light and power industry of Japan was in 1921 about one-fifth the total investment in the industry in the United States, although the number of generating plants in Japan was only about 26 per cent less than the number in the United States. The average investment per company in Japan has tripled since 1909, being 2,190,000 yen in 1921.

THE ELECTRICAL INDUSTRY IN JAPAN IS HIGHLY STANDARDIZED



The normally high dividend rates maintained by the Japanese companies are interesting. In 1912 there were nine companies paying an annual dividend of more than 15 per cent, and in 1920 there were forty-nine paying over 15 per cent. An accompanying table gives additional data on dividend rates. The increase in the number of companies which reported a deficit may appear paradoxical in view of the business prosperity during the past few years. The majority of these companies were, however, newly organized concerns which had not built up their business sufficiently to enable a profit to be made.

The dividend rates which are being maintained by some of the Japanese companies are far above those of electric light and power companies of the United States, which operate under government regulation. The Kansai Electric Company and the Hokkaido Water Power Company each were paying 20 per cent during the first part of 1921, and the average rate of dividends for all companies was 14.1 per cent.

Electrical Education in 1924

Enrollments and Appropriations Increase—Broader Training Includes Many Utility Courses—More Graduate Scholarships Needed—Analysis of Trends

ABOUT 2,400 electrical students will be graduated from American colleges in June and 3,693 juniors will become seniors. These figures represent almost 100 per cent returns from the recent annual educational survey made by the ELECTRICAL WORLD.

The increase in attendance in electrical schools is very small over that of last year and it is noticeable that the attendance in Group III schools is decreasing in both the junior and the senior year and that the same conditions are noticed in the ten outstanding colleges. Thus the Group I and Group II schools appear most prosperous from the standpoint of attendance.

It is very discouraging to note that only 266 graduate students are enrolled, although it is understandable that most of these are enrolled in the larger or most outstanding schools. As a rule these men spend 75 per cent of their time in prescribed work and the remainder in individual research work.

A remarkable fact is that about one-third of the students enrolled as juniors fail to graduate—1,000 in 3,000 drop by the wayside or shift into other courses. This turnover indicates a necessity for some real study of education to prevent such a large loss.

WHERE THE MONEY GOES

The electrical departments of the colleges have a gross appropriation of $1,783,349 for instruction, new equipment, maintenance and supplies. This amounts

TABLE I—THE HISTORY OF ATTENDANCE AND GRADUATION FROM THE ELECTRICAL ENGINEERING COLLEGES AND SCHOOLS OF THE COUNTRY—1915-1925

College Year	Juniors					Seniors					Graduates at End of Year				
	In Ten Colleges Having Outstanding Electrical Engineering Departments	Group I	Group II	Group III	Total in Three Groups	In Ten Colleges Having Outstanding Electrical Engineering Departments	Group I	Group II	Group III	Total in Three Groups	In Ten Colleges Having Outstanding Electrical Engineering Departments	Group I	Group II	Group III	Total in Three Groups
1915-1916	551	1,302	669	265	2,236	442	1,012	501	186	1,699	357	880	453	162	1,495
1916-1917	436	1,113	656	238	2,007	452	1,090	512	231	1,833	374	886	438	203	1,527
1917-1918	328	793	589	275	1,657	290	719	441	194	1,354	276	602	368	164	1,134
1918-1919	387	906	604	268	1,778	196	535	415	175	1,125	192	472	338	155	965
1919-1920	639	1,373	795	242	2,410	352	931	471	237	1,639	289	789	408	200	1,397
1920-1921	724	1,615	931	264	2,810	437	1,061	580	239	1,880	366	910	479	206	1,595
1921-1922	1,019	2,222	1,043	360	3,625	625	1,407	695	255	2,357	567	1,237	746	227	2,210
1922-1923	915	2,022	1,035	300	3,357	700	1,615	883	287	2,785	605	1,421	767	253	2,441
1923-1924	883	1,988	1,144	330	3,462	778	1,742	923	290	2,958	430	1,392	809	205	2,406
1924-1925	707	2,027	1,428	238	3,693	575	1,669	990	239	2,898	...	.....	...	...	.....

TABLE II—POST-GRADUATE STUDENTS IN ELECTRICAL COLLEGES AND SCHOOLS OF THE COUNTRY

College Year	In Ten Colleges Having Outstanding Electrical Engineering Departments	Group I	Group II	Group III	Total in Three Groups	Proportion of Time Spent in Prescribed Courses (Per Cent)				Proportion of Time Spent in Individual Research (Per Cent)			
						Ten Colleges	Group I	Group II	Group III	Ten Colleges	Group I	Group II	Group III
1924–1925	130	217	47	2	266	73	65	62	100	27	35	38	0

to about $300 per student based on the junior and senior enrollments. The outstanding schools are noticeably low in appropriation per student. (Table III.)

The schools spend two and one-half times as much for instruction as for other purposes, and the proportion is highest for the Group I schools. It is also remarkable that the ten outstanding schools spend an average of $3,400 per year for new equipment, as compared with an expenditure of about $12,000 a year for maintenance and supplies.

Another interesting fact is that the ten outstanding electrical schools average one $610 scholarship per school. This certainly indicates a fertile field for philanthropy for those desiring to support competent men in educational institutions.

Some very interesting data are found in Table V. It appears that the reputation of a school affects greatly the attendance in a given engineering subject. It is quite evident that a move is well under way to give special courses in finance, management, public utilities and administrative work. By far the larger number of special courses are given in industrial or administrative engineering, but in the Group I schools and in the outstanding colleges a trend is apparent to a greater diversity in courses offered.

The data as a whole show a very encouraging situation in the electrical education. They show that the schools are doing their utmost to supply the demand for young men trained in the fundamental sciences and that improvements in financial and educational conditions are being made.

TABLE III—TOTAL APPROPRIATIONS MADE FOR ELECTRICAL DEPARTMENTS BY THE COLLEGES AND SCHOOLS OF THE COUNTRY

College Year	Total Appropriations				Total Appropriations per Student*			
	In Ten Colleges Having Outstanding Electrical Engineering Departments	Group I	Group II	Total for Two Groups	In Ten Colleges Having Outstanding Electrical Engineering Departments	Group I	Group II	Total for Two Groups
1921–1922..	$361,633	$880,412	$531,289	$1,411,701	$220	$242	$306	$273
1922–1923..	401,613	957,643	578,578	1,536,221	248	264	302	277
1923–1924..	434,023	1131,897	651,452	1,783,349	251	304	314	308

*Total number of juniors and seniors taken as basis.

TABLE IV—DISTRIBUTION OF 1923–1924 APPROPRIATION FOR ELECTRICAL ENGINEERING COLLEGES AND SCHOOLS

Distribution of Appropriation	In Ten Colleges Having Outstanding Electrical Engineering Departments	Group I	Group II	Total for Two Groups
Instructing staff	$275,000	$790,000	$485,300	$1,275,300
New laboratory equipment	34,100	159,400	105,300	264,700
Maintenance and supplies	118,800	170,500	52,900	223,400
Scholarships	6,100	12,000	7,950	19,950

TABLE V—SPECIAL COURSES ON UTILITIES GIVEN IN ELECTRICAL ENGINEERING COLLEGES AND SCHOOLS

	In Ten Colleges Having Outstanding Electrical Engineering Departments	Group I	Group II	Group III
Ratio of number of electrical engineering students to number in other engineering colleges	1 to 3.4	1 to 3.2	1 to 2.8	1 to 1.9
Are special courses given in:				
Public Utility Engineering				
No.	7	30	59	3
Yes	3	17	6	1
Public Utility Finance—				
No.	7	27	60	4
Yes	3	10	5	0
Public Utilities Management—No.	7	28	60	4
Yes	3	9	5	0
Administrative or industrial Engineering—No.	3	18	37	3
Yes	7	19	28	1

Growing Demand for Electricity in England

THE United States Vice-Consul in Manchester, England, Charles W. Lewis, Jr., reports that there is a steadily growing demand for electric service in England and that the leaders of the electrical industry are making every effort to encourage this demand, particularly by domestic consumers. It has been said that development in England has been slow because the rates have been too high. The domestic rates have been higher than in other countries, but the power rates compare very favorably with all other countries, including the United States. The progressive companies in England are now attempting to develop their domestic load to a point where they can reduce rates for this service and so make it still more attractive to consumers.

The greatest problem in England is the wiring of old houses. In the city of Manchester, for example, there are only ten thousand dwellings wired, which is approximately 5 per cent of the residences in the city. The industry is now considering plans to wire these old houses on the deferred-payment system so widely adopted in the United States. To increase further the domestic load many electric companies have adopted systems of renting various domestic cooking and heating appliances to the public and maintaining them in repair at very reasonable cost.

Very little developed in the line of railroad electrification in 1924, though one section of line near Manchester was electrified at a cost of about $3,000,000. There is little work projected in this direction for 1925, though the gradual progress made in consolidating electric systems and supplying them from central superpower plants of the most economical design may ultimately bring the cost of power down to a point where most of the railroads will change to electric power.

Utility Storeroom and Shops

Labor-Saving Devices and Modern Facilities Are Provided at New Plant of Southern California Edison Company—Pole-Treating Plant, Oil-Storage Tanks and Coil-Winding Shop Are Among Interesting Features

By W. R. FRAMPTON, C. E. DECKER and W. J. McCULLOUGH
Southern California Edison Company, Los Angeles, Cal.

AIRPLANE VIEW OF THE ALHAMBRA SHOPS OF THE SOUTHERN CALIFORNIA EDISON COMPANY

IN THE new general stores, shop and test departments of the Southern California Edison Company at Alhambra, Cal., is to be found every modern convenience and facility for the rapid and economical handling of material and supplies such as used by a large central station. Having outgrown old quarters, the company acquired twenty-seven acres of ground in Alhambra, just outside the city limits of Los Angeles, convenient to rail transportation and a system of paved highways, where it has erected a general storeroom, repair shop, meter-test department, laboratory, pole yard and pole-treating plant, oil-filtering equipment and oil-storage tanks. Besides nearly doubling the capacity of the former quarters, provision has been made for future expansion.

An airplane view gives a general idea of the plant as a whole, while another illustration shows the layout of grounds. The property is located on the main line of the Southern Pacific Railway, and sidings have been provided for incoming and outgoing cars. In addition, there are approximately two miles of railway and two miles of concrete and decomposed granite roadways on the property, furnishing direct access to any branch of the three departments.

The property is improved with ten buildings having a total floor area of 330,000 sq.ft., or 7½ acres. All buildings are of reinforced concrete construction and are fireproof. A 100,000-gal. steel water tower and a 200,000-gal. concrete water reservoir have been provided. A reinforced concrete oil house is connected with eight steel storage tanks having a total storage capacity of 365,000 gal. of circuit breaker and transformer oil. In addition to the buildings comprising the three major departments, consisting of the stores, the test and the shop departments, there is a covered storage platform, an obsolete and scrap material department, a small reclamation shop that is used in connection with the scrap and obsolete material department and a hospital and employment building. All buildings face a central 50-ft. driveway.

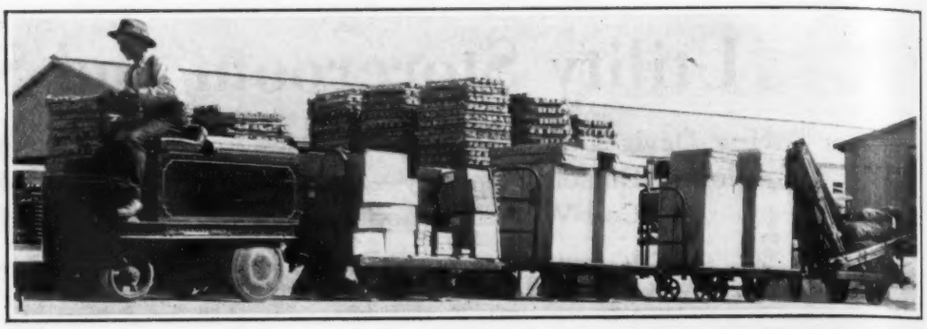
The general stores department was designed for simplicity, economy and ease of handling the large stocks carried. Modern equipment has been provided for facilitating the handling of materials. Included in these devices are the following: Locomotive cranes, jib cranes, overhead cranes, electric tractors, trailers, elevating trucks, revolvators, automatic scales, material-counting machines, cross-arm painting machine, gravity conveyors, etc. Some of this equipment is illustrated here.

CLASSIFICATION OF STOCKS

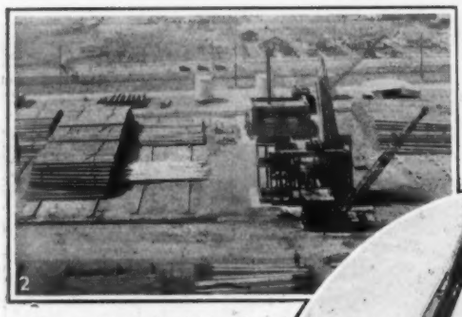
The stock carried in the general store is divided in twelve sections as follows:

1—Motors, compensators, transformers, regulators, etc.
2—Meters, relays, switchboard instruments, etc.
3—General electrical materials.
4—General hardware.
5—Bar and sheet brass, insulating materials; trans-

Modern Equipment for Handling Material

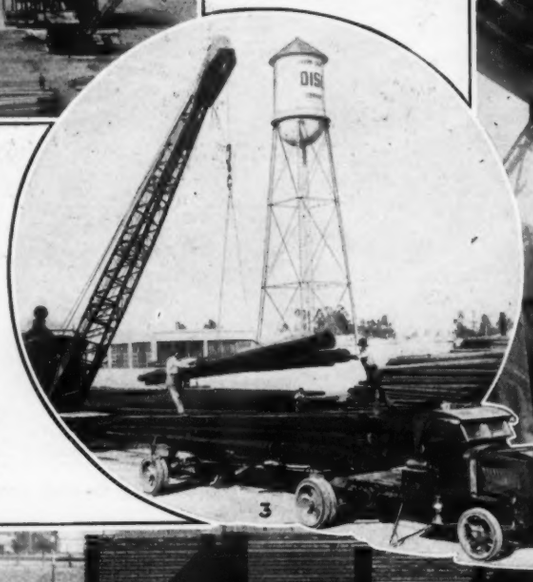


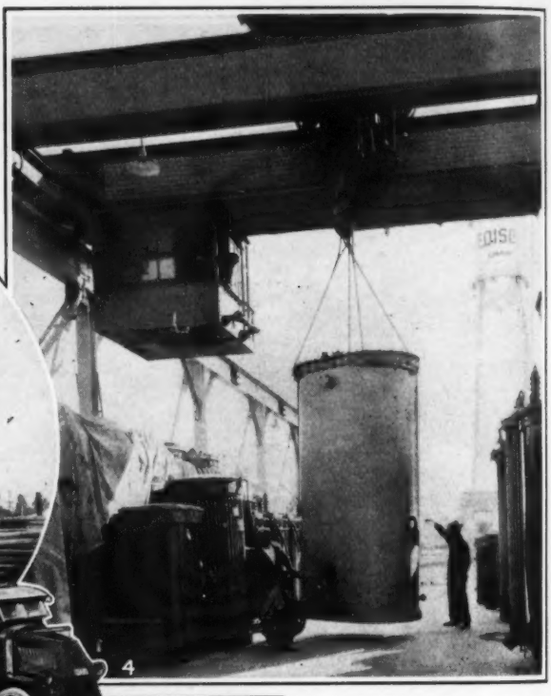
No. 1. Electric tractor and trailers used for handling materials.



No. 2. Partial view of pole yard showing the pole-treating plant.

No. 3. Locomotive crane for loading poles for shipment.



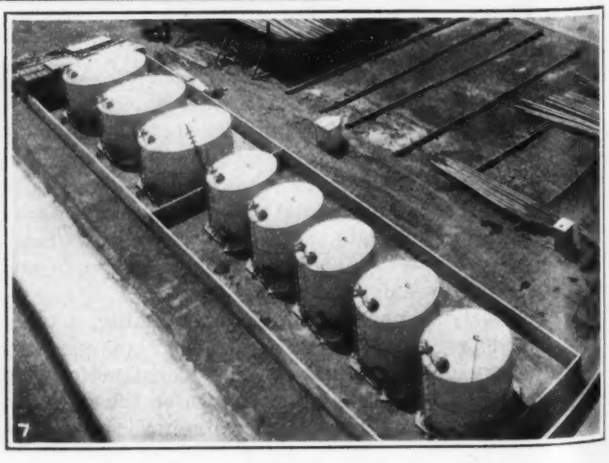


No. 4. Forty-ton crane for handling transformers and other heavy equipment.

No. 5. Cross-arm painting machine, which has reduced cost of painting arms.

No. 6. Looking down the central aisle in the general storeroom.

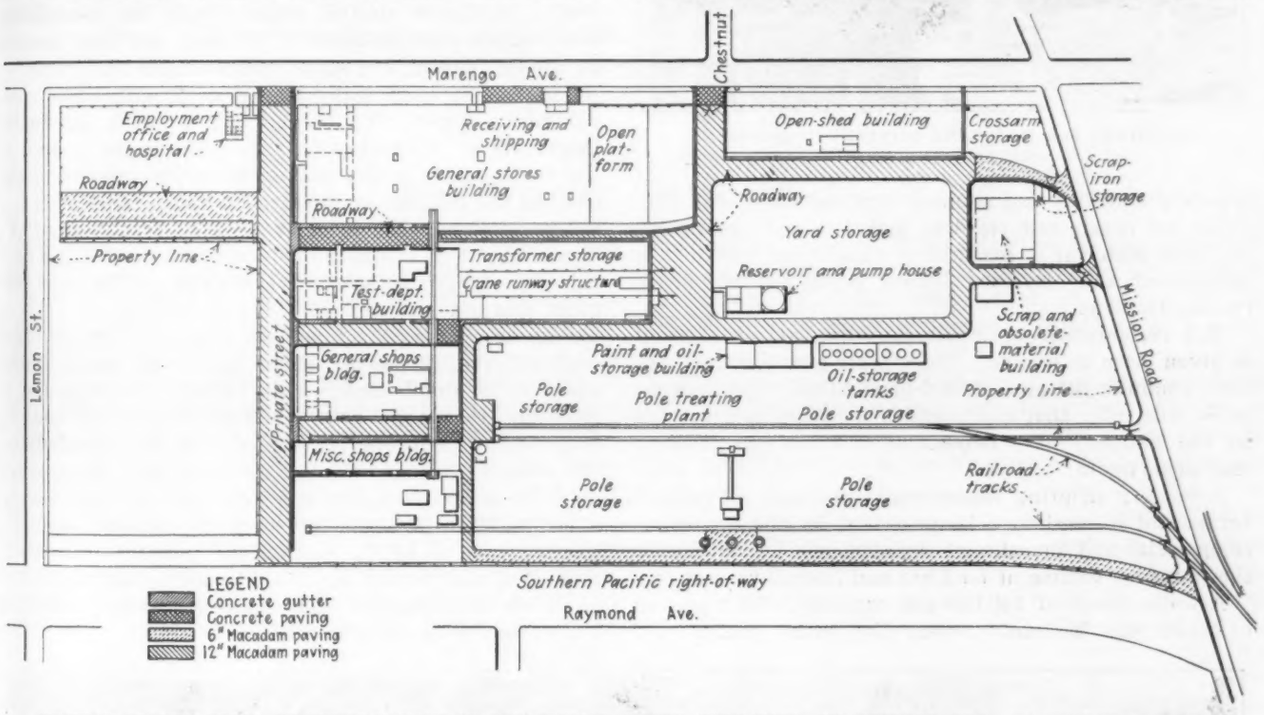
No. 7. Pole yard with oil-storage tanks in the foreground.



former bushings, magnet wire and miscellaneous repair parts.

6—Wire and cable.
7—Poles, cross-arms and lumber.
8—Stationary, office supplies, sales appliances and office furniture.
9—Scrap and obsolete materials.
10—Acids, paints and oils.
11—Iron and steel.

Each section is in charge of a section storekeeper, who is responsible for maintaining the stock in his particular section. Stock books are provided in which an inventory of stock is taken once a month. At this time a record is also made of the amount due on unfilled orders, the amount being ordered and the amount for which he is holding back orders. When the monthly inventory has been taken, the stock book is personally checked with the section storekeeper by the storekeeper and purchase requisitions are written. All requisitions are based on the previous three months' consumption of the article, taking the season of the year and any special demands into consideration. The section storekeeper has the necessary assistants to handle the receipts and issues and to care properly for the material in his section.



GENERAL GROUND PLAN, SHOWING LAYOUT OF STOREROOMS, SHOPS, POLE YARD, OIL STORAGE, ETC., AT ALHAMBRA SHOPS

MATERIAL STORED FOR CONVENIENT USE OR SHIPMENT

All material is stored conveniently for use or for shipment. Iron and steel is stored near the erecting and blacksmith shop. The material for repairs to electrical and mechanical equipment is stored in the center of the main shop, all meters, relays, etc., are located in the test department building for convenience of both store and test departments in testing, calibrating and handling. All insulators, switches and similar material requiring voltage tests are carried in an open shed building in which the necessary equipment for testing has been set up by the test department.

The return to the general store of a large amount of material and equipment on which repairs are necessary before it could be returned to service made it advisable to segregate the material and equipment in bad order from that ready for service. It was also desirable to know the value of the stock on hand in bad order. Furthermore, on receipt of requests as to the quantity of a certain item on hand, the records prior to the establishment of the hospital section showed the total stock, bad order and good. The bad order material and equipment are now held in the hospital section until finally repaired and tested and the section storekeeper's records reflect the quantities ready for immediate use only. All receiving papers, orders on shop or test departments, for repairs and test are held by the hospital section, which on receipt of the repaired article sends the material with the papers to the section in which it is standard stock.

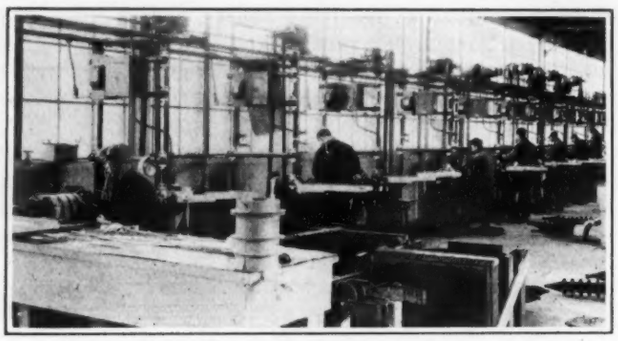
The company is one of the largest users of poles in the United States. To insure having thoroughly seasoned poles to get the correct penetration of creosote, there has been installed one of the most modern open-tank process pole-treating plants in the West. Two locomotive steam cranes are used for loading and unloading cars and trucks and for handling the poles in and out of the treating tanks. Approximately 90 per cent of the poles used are delivered direct from the yard to the job by company trucks and dollies. The capacity of the plant is about 125 poles per day. The operations consist of shaving, roofing, gaining, treating, painting and boring.

A motor-driven machine has recently been designed for painting cross-arms and is being operated with great success. Cross-arms are put through this machine at the rate of eleven per minute. While this rate cannot be maintained for eight hours, on account of moving from one location to another, the saving over the old method of dipping or hand painting is very noticeable and eliminates a job distasteful to workmen.

One of the noticeable savings effected in the new plant is found in the handling of transformer and switch oil, which was heretofore purchased in drums.

At the new plant ample storage has been provided, consisting of three tanks of 30,000-gal. capacity each for transformer oil and five tanks of 15,000-gal. capacity each for switch oil. The control of this oil is handled through a series of pumps, filters, driers, pipes, etc. The delivery of all transformer and switch oil to various points on the system in trucks equipped with tanks is being considered, which will eliminate drums altogether except in small shipments.

A separate store building and organization and a



MACHINES FOR HANDLING DIFFERENT CLASSES OF COIL-WINDING WORK

separate material and supplies account have been provided for scrap and obsolete material and equipment. All such material is brought to this store, where it is segregated and classified before being placed on the market for sale.

The reclamation of materials, tools and equipment is given close attention. Tools, pipe, pipe fittings, conduit, condulet fittings, second-hand lumber, cross-arms, poles, oils, etc., that can possibly be reclaimed for use by the company at a reasonable cost are put through this department.

A modern printing department furnishes all printed forms and is used to a large extent by the executive, commercial and investment departments in furnishing the immense volume of booklets and literature sent out.

A water tower of 100,000-gal. capacity with a system of pipes and hydrants covers the entire plant. All buildings are equipped with overhead sprinkler systems. An auxiliary system consisting of a reservoir of 150,000-gal. capacity operated in connection with two 10-hp. motor-driven pumps with a local fire department provides adequate fire protection.

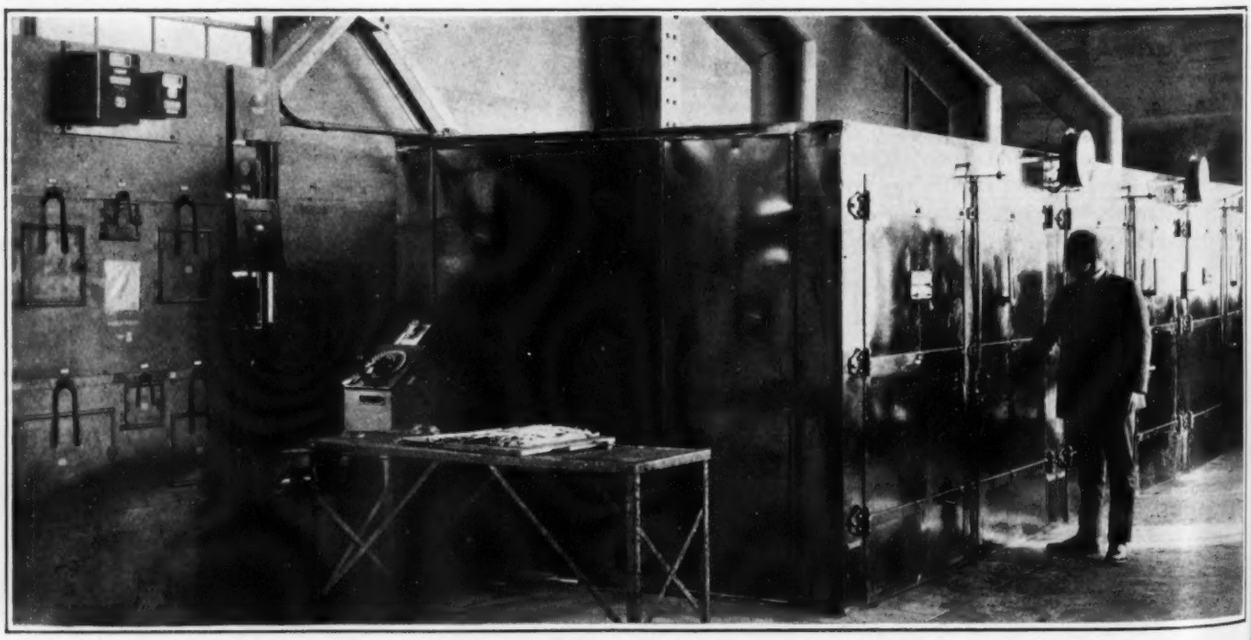
SHOP DEPARTMENT

The shops consist of an electrical repair shop, mechanical shop, carpenter shop, blacksmith shop, an electro-galvanizing plant, a structural-steel fabrication shop and a research department. The general plan shows the convenient arrangement for interconnection between departments. In the machine shop there is a 5-ton electric crane over one-half of the main floor where some of the larger machine tools are located.

The electrical department is very complete for the class of work the company handles. As 75 per cent of the work in this department is repairing or rewinding transformers, the floor was arranged especially for such work. A 15-ton electric crane covers the assembling floor, which contains a pit 15 ft. deep and long enough to handle four or five large transformers at a time.

There is an electrically heated oven with three compartments 8x8x7 ft., all controlled with automatic thermostats. A truck with a skeleton frame is used in the ovens and is loaded with coils to the capacity of the oven at the dipping or varnishing vats. It is then but a few minutes' work to draw a loaded truck out of the oven and put in another. Thus a great deal of the heat is retained and the ovens are worked in the most efficient manner.

Sixteen winding machines are in use. There are several different types of these machines, some being adapted to small work, while others are capable of handling the large coils of 5,000-kw. to 10,000-kw. transformers. In one year more than 3,000 transformers passed through this department and there were more than 600 complete rewinds. Every transformer after passing through the shop department is given the standard A.I.E.E. test before going to the stock room. A cost record is kept of each transformer and no work is attempted that does not show a decided money saving to the company.



ELECTRIC OVENS WITH AUTOMATIC TEMPERATURE CONTROL ARE USED FOR BAKING COILS IN THE WINDING SHOP

Due to the distance from the large transformer factories and the fact that special dimension copper wire is often used, it was found necessary to install an insulating machine. This machine, in connection with a wire-stripping machine, is now in almost constant use and has not only proved to be a good investment for special wire but will compete in price on regular round magnet wire.

The steel-fabricating shop has been the means of using up large quantities of tower steel that constantly accumulates with a company in an extensive transmission program. The plant has a Pels No. 20 punch and shear capable of shearing a 6-in. I-beam. Transmission towers or substation outdoor racks are built or rebuilt to meet any specification out of old or odd lots of tower steel. It is felt that this plant has been a real financial success.

The electrogalvanizing plant takes material up to 12 ft. in length and with a rotating barrel can handle small bolts and washers, etc., to good advantage. This department has just been started, but confidence is felt in its success.

Subsequent articles will describe the apparatus-test division, the meter-test department and the electrical-standardizing laboratory, which are also located with the service station at Alhambra.

Automatic Heat Balance Control

How the Problem of Constant Temperature Maintenance Is Automatically Accomplished in the 25,000-Kva. Saxton Plant of Penn Central Light & Power Company

By W. A. KATES
Day & Zimmermann, Inc., Philadelphia, Pa.

WHERE exhaust steam is used for heating feed water, the problem of constant temperature maintenance reduces itself to one of proportioning the supply of steam to the boiler-feed water temperature. This was automatically accomplished at the 25,000-kva. Saxton plant of the Penn Central Light & Power Company by regulation of the load on the house turbine and hence its exhaust steam. Although the boiler-feed pump furnishes exhaust steam for feed-water heating, the house turbine is the larger and controlling unit except at low station load conditions referred to in another part of this article. The electrical connections between the main station bus and the house generator are shown in Fig. 3. The exhaust steam and feed-water piping system are shown in Fig. 4.

The house generator is electrically connected to the main station bus and can, therefore, exchange load with the main units regardless of the station auxiliary power load. The house turbine exhausts at about atmospheric pressure into the exhaust-steam header. From this header steam is taken for feed-water heating and mixes with the feed water in a small jet condenser. The heated water flows from the jet condenser into a small air-liberating tank, from which the air is continually drawn off by an ejector. On leaving the air-liberating tank the boiler feed flows through the usual boiler-feed tank to the feed pumps and boilers.

As stated before, the problem of maintaining a constant feed-water temperature reduces itself to the regulation of the house-turbine load according to the boiler-feed water temperature. The control element for doing this consists of a small platinum resistance thermometer in the air-liberating tank. This thermometer is connected in one arm of a Wheatstone bridge. The galvanometer of this bridge actuates a Leeds & Northrup proportionate controller. When the thermometer indicates a predetermined normal temperature, the bridge galvanometer shows zero deflection and no change in the house-turbine load is effected. Departure from this predetermined temperature unbalances the Wheatstone bridge and raises or lowers the house-turbine load. These changes in load are proportionate to the departure of the temperature, decreasing as the temperature approaches normal. They become a maximum at about 7 deg. departure.

These adjustments of this system and the method of counteracting the time lags are of interest. The actual mechanism of the proportionate controller are given in Fig. 1, in which (1) is the Wheatstone bridge galvanometer needle. As the shaft (2) revolves, the small cam (3) lifts the bar (4) and causes the needle to be caught between the hinge jaws (7-7) and the jaw on the rising bar (4). Since the space between the jaws (7-7) and (4) is tapered toward the pivoted out ends of the jaws (7-7), the swinging of these jaws (7-7) will be proportional to the deflection of the needle. Therefore the rotation of the cam followers (5-5) and the duration of contact between them and the cams (6-6) will be proportional to the water temperature unbalance. Contact between the cams (6-6) and their followers (5-5) energizes small relays controlling the house turbine governor motor.

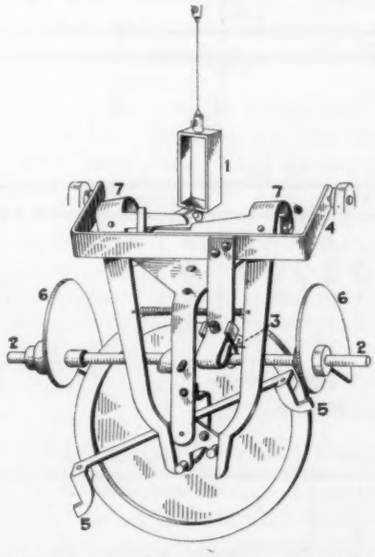


FIG. 1 — DEVICE FOR REGULATING HOUSE TURBINE LOAD FOR HEAT BALANCING

As first designed, the shaft (2) rotated at 15 r.p.m. Upon installation, this speed was found to be much too

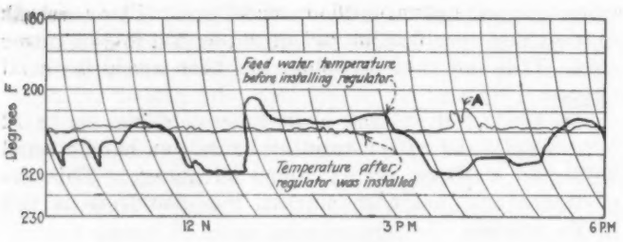


FIG. 2—FEED WATER TEMPERATURE BEFORE AND AFTER INSTALLING REGULATOR

The dips in temperature noted at A were caused by the simultaneous shutting down of one boiler and the change from two turbines each at half load to one turbine at full load. This dip amounted to 5 deg. from the mean obtained during the day. It may be noted that, aside from this interruption, the average range of temperature is less than 3 deg. F.

great because of the time necessary for a change of load on the house turbine to affect the feed-water temperature. Preliminary calculations showed this lag to be approximately two and a half minutes. Actual operation, however, showed that this time varied from two and a half minutes to four minutes, depending on the quantity of water passing through the feed-water system and the quantity of steam passing from the exhaust-steam header to the heater condenser. By maintaining the water level in the air-liberating tank only high enough to cover the control-thermometer element, this time lag in the piping system itself was reduced to a minimum, and the compensation for the remaining lag was accomplished in the automatic-control instrument. The speed of the shaft (2) was reduced to approximately 2½ r.p.m., which speed gave the proper interval between successive load changes. However, it resulted in large changes in load for small temperature unbalances due to low angular velocity of the cams (6-6). To correct this latter action, the cams were cut to a sharper involute shape. One of the cams also was cut on a sharper involute than the other to compensate for the fact that the governor motor increased the load on the house turbine more than it decreased it during an equal period of motor operation. Next the sensitivity of the thermometer-control circuit was increased by raising the voltage on the Wheatstone bridge, making the galvanometer respond to smaller changes of water temperature. In conjunction, the taper between the fixed and movable jaws was changed to combine the requisite sensitivity with the proper maximum change of load. With other minor adjustments, the time lag of the piping system was compensated for and quite constant feed-water temperature was obtained.

In addition to proper adjustment of the control system, attention had to be given to the limits of the controller and affected apparatus. Referring to Fig. 3, it is seen that the house generator is electrically connected to the main station bus through the 1,500-kva. station auxiliary transformer bank. The three breakers on this circuit are so interlocked that all three breakers trip from any disturbance on this feeder, and when these breakers are open the house generator cannot exchange load with the main bus. The power supply to the automatic instrument is therefore connected through a suitable relay to the potential transformers on this feeder. De-energizing the feeder disconnects the automatic controller. The power supply is also connected through interlocks on the governor switches on the turbine room gage board and in the operating room. In times of

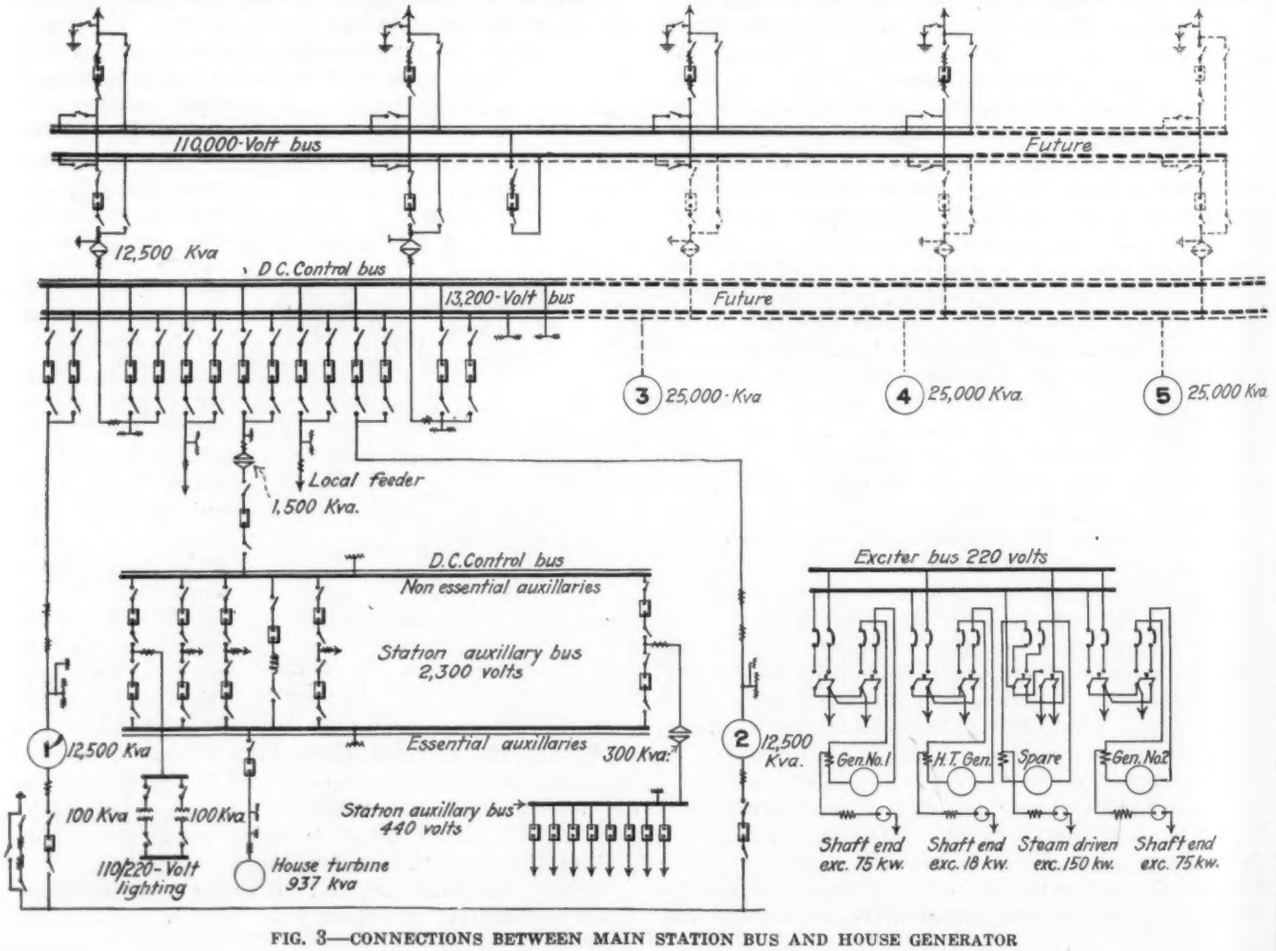


FIG. 3—CONNECTIONS BETWEEN MAIN STATION BUS AND HOUSE GENERATOR

emergency, the floor man in the turbine room can shift load on the house turbine and thereby supersede the automatic control instrument. In turn the floor man and the automatic instrument can be superseded when necessary by the operator in the switchboard room.

Protection from kilowatt overload of the house generator is effected by setting the governor limit switch on the house turbine so that the machine can take its maximum load at the normal frequency and maximum steam and exhaust pressure conditions. Protection from kilovolt-ampere overload is effected by relays that trip the 2,300-volt auxiliary bus tie breaker when the house turbine has a kilovolt-ampere overload. Since the essential auxiliaries are connected to the house turbine bus, such action leaves these auxiliaries supplied with power by the house turbine.

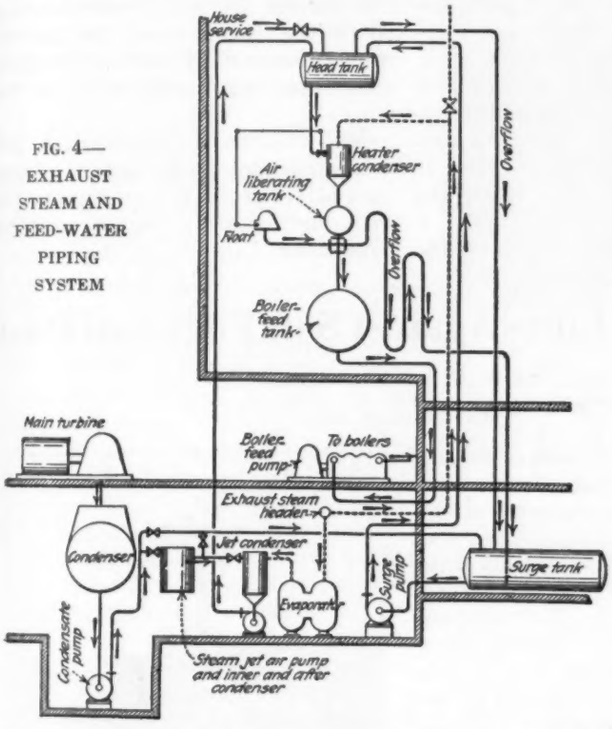


FIG. 4—EXHAUST STEAM AND FEED-WATER PIPING SYSTEM

In times of very light load on the main units the exhaust steam supplied by the boiler-feed pump is more than enough for feed-water heating, and as there is no electrically driven feed pump in the station, the steam pump cannot be shut down. Therefore at such periods the house turbine is removed from automatic control and set at a constant light load until such time as the main station load increases. Were this not done, the feed-water control would shut off steam from the house turbine and motorize the house generator, thereby possibly overheating the blades of the former. Automatic protection against such conditions might be effected through an auxiliary limit switch on the house turbine, which would disconnect the automatic control when the steam flow to the unit reached a small value. However, the Saxton plant is a base load plant, therefore conditions of light load will not be encountered frequently during normal operation.

Records of the boiler-feed water temperature before and after installation of the automatic control instrument are shown in Fig. 2.

Although this automatic control has been in operation only a few months, the results obtained from it are very gratifying. It has resulted in a much more uniform feed-water temperature, with consequently lower oxygen content, and promises to be a great improvement over the former method of temperature control.

Letters from Our Readers

Operating Costs Useless Unless Inclusive

To the Editor of the ELECTRICAL WORLD:

There are a few things in connection with the article entitled "Municipal Diesel Operation at Low Rates" that appeared in the April 11 number of the ELECTRICAL WORLD which it seems to me should receive careful consideration before accepting the statements made.

In the first place, the cost of the entire plant (1,500 kw. installed capacity) is given as $118,363.27, which it is stated includes the motor-driven, high-pressure air compressors, cement fuel-oil tanks and, I take it, the building in which the equipment is housed. This figure seems rather low in view of prices which we have had on equipment of a similar nature.

The cost of generation is given at 1.63 cents per kilowatt-hour, and following that statement appears the information that this cost includes fuel, labor, repairs, sundries, lubricating oil, interest on bonds, overhead and distributing expense. A full statement of costs should include not only interest on bonds but interest on other money invested. The cost is given as $118,363.27. With interest at 6 per cent, that would amount to $7,101.80. Depreciation, one of the most important items, has been omitted entirely. My opinion is that it should be at least 7 per cent and possibly more. Assuming, however, that depreciation may be considered at 7 per cent, that would mean an annual cost of $8,285.43. If to those two figures are added the fuel cost, lubricating oils, repairs and additional labor, totaling $6,713, we have a total cost of $22,100.84. The cost of generating 636,300 kw.-hr. was nearly 3.5 cents per kilowatt-hour.

It should also be noted that the labor is shown as additional labor only and the amount given is less than what the salary would be for one man for the entire year. Just how this labor charge has been separated is not entirely clear. It seems unfortunate that statements of this kind should appear without explanation. It certainly is entirely unfair to give the cost of generation without taking into consideration an adequate allowance for interest on the investment and depreciation.

R. G. WALTER,
General Superintendent.

Wisconsin Power & Light Company,
Madison, Wis.

Electrical Development in the Soudan

A CONTRACT was recently signed between the Soudan government and a group of prominent English electrical manufacturers, operators and financiers for reconstructing and electrifying the present street-railway system of Khartoum, for the development of the light and power system in Khartoum and for the extension of both the traction and power systems to Omdurman. An English limited company is being formed with a capital of £356,000 and is authorized to issue £400,000 debentures guaranteed by the British Treasury. The capital stock of this company will be divided between the private companies and the Soudan government.

Central Station and Industrial Practice

Electric Space Heaters Used in Making Kegs

BY S. A. FROST
Spaulding & Frost Company, Fremont, N. H.

ELECTRIC space heaters have been found to be very economical in the manufacture of wooden kegs by the Spaulding & Frost Company, Fremont, N. H. Kegs are made in sizes up to 20-gal. capacity, and are

PROCESS OF KEG MANUFACTURE IN WHICH SPACE HEATERS ARE USED

used for holding pickles, fish and other food products. In making these kegs, the finished staves are placed in a barrel machine, which bends the staves into the form of the finished barrel. A heavy steel ring is then placed at each end of the staves. It is necessary to heat the barrel thoroughly before these steel rings are removed and the hoops applied; otherwise either the hoops would break or the staves would crack.

The heating elements of the heaters consist of standard Westinghouse space heaters, assembled on a circular frame. There are two series of heaters. Each series consists of six heaters, as shown in the accompanying illustration, and stands opposite a machine which assembles the staves in the steel rings.

The operator takes a barrel from the machine, raises the cover by means of a foot lever and sets the barrel over the heater with the space heaters inside. The foot lever is then released and the cover drops. In a minute or two the barrel is removed, ready for the hoops.

Before installing the electric outfit, open-flame heaters were used. These consisted of pieces of 6-in. stovepipe about 2-ft. long, in which waste wood was burned. The bottom of the pipe was raised about 6 in. above the floor. Six of these heaters were set together in a large brick structure resembling an open fireplace. It was not only hot and disagreeable for the workmen, but there was considerable fire risk.

After a disastrous fire in 1921, it was decided to do away with unnecessary fire hazards, and the electric heaters were installed. There is no danger of their setting fire to the barrels.

Also, since the installation of the electric heaters, there has been less breakage in manufacture, due to the fact that with electric heat the barrel appears to be heated uniformly throughout with rapid penetration of heat to the exterior of the barrel. No barrels are lost by overheating. With the old method, the barrels would occasionally catch fire and in many cases were badly singed on the inside.

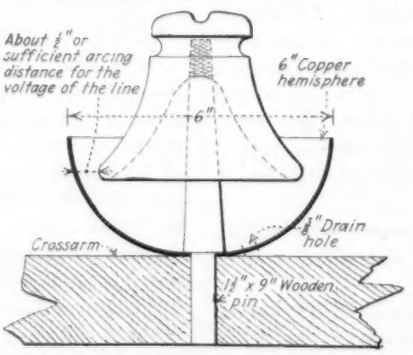
The cost of the installation has more than paid for itself by giving us a better product, reducing the fire risk and creating better working conditions.

Protecting Lines Against Salt Fogs and Dust

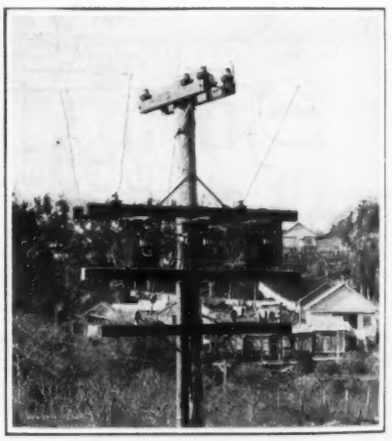
BY W. R. VAN BOKKELEN
Chief Engineer Coast Counties Gas & Electric Company, San Francisco, Cal.

YEARS of trouble with pins and crossarms burning off due to a combination of cement dust and salt fog has led the Coast Counties Gas & Electric Company to develop what it calls a "fog box." The device, which is shown in the accompanying illustrations, consists simply of a 6-in. copper hemisphere with a hole cut in the bottom and installed on the pin in the manner shown.

What this does is to prevent the dust and moisture from being swirled up from below and deposited on the under side of the insulator. It has been found that if the under side of the insulators can be kept clean no trouble is experienced with the pins and crossarms burning off. Eight miles of 4-kv. line along the coast in Santa Cruz County, Cal., has been equipped with these fog boxes for a year and not one case of trouble has developed in that time, whereas before their installation line failures


About ½" or sufficient arcing distance for the voltage of the line
6" Copper hemisphere
6"
Crossarm
½" Drain hole
1½" x 9" Wooden pin

METHOD OF INSTALLING "FOG BOX"



COPPER HEMISPHERES INSTALLED ON 4-KV. LINE AFFORD PROTECTION AGAINST SALT FOGS AND CEMENT DUST

were a very common occurrence. Such a device has proved effective against salt fog or cement dust alone or against a combination of both.

Some of the copper hemispheres used were made by taking one-half of a copper float ball, while others were made especially for the purpose. In either case the cost is about twenty-five cents apiece. Central stations supplying service to cement plants are familiar with what a little cement dust and moisture will do, and maintaining uninterrupted service on lines in the vicinity of cement plants has been a problem. So much trouble of this character was experienced by one California central station that duplicate 60-kv. lines were built for

some distance back from a cement plant so that one line could always be out of service for cleaning the insulators.

A large insulator manufacturer has interested himself in this problem and is experimenting with hemispherical bowls made out of glazed porcelain to be installed on high-voltage pin-type insulators in a manner similar to that used with the copper hemispheres described above. Based upon results on lower voltage lines, this method of protection offers promising possibilities.

Checking Motor Brush Life Periodically

By F. Shanks
Electric Plant Superintendent Indianapolis (Ind.) Light & Heat Company

TO KEEP motor brushes operating at maximum life, special attention should be directed toward the tension on brush holders. Unless proper tension is kept on the brushes, many troubles will occur and the life of the brush will be shortened. Tests on motor brush tension at the Mill Street station of the Indianapolis Light & Heat Company has shown that proper brush tension varies for the type of motor service. For instance, on a 100-kw., 1,800-r.p.m., 250-volt exciter, it was found that the tension of a brush 1½ in. wide by ⅝ in. thick should not be less than 1 lb. nor more than 1½ lb. read on a spring scale. This gave a surface of about 1¾ sq.in.

However, on larger heavy duty motors, such as for cranes and coal hoists, it was found that this brush tension should be increased from 4 lb. to 7 lb. This increased tension was necessary because of the higher current densities carried by these motors, which required good brush contact to prevent sparking.

As a result of checking the spring tension on brushes and keeping records of monthly replacements, the wearing-down rate of brushes was readily determined. For instance, on the exciter above mentioned, using the experimental spring tension of an average of 1¼ lb., the brushes will wear down about 3/32 in. per month. With this rate determined, the electrical maintenance superintendent can readily decide when his brushes must be replaced in order to keep the plant operating. Such a record of brush-wearing rates will help in scheduling proper brush replacements.

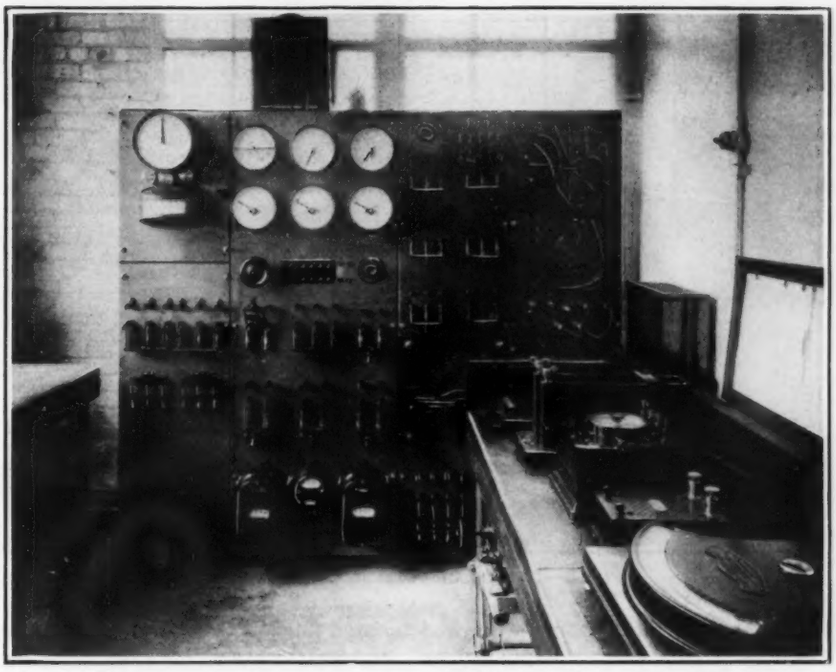


FIG. 1—CONTROL THAT MAKES ANY VOLTAGE AVAILABLE AT TEST TABLE

Facilities for Standardization of Instruments and Rotating Standards

By J. R. Halladay
Meter-Relay Engineer, Warren Division, Ohio Public Service Company

MANY utilities, especially those not requiring an elaborate outlay of meter-testing equipment, are confronted with the problem of providing the essential facilities for standardization of instruments and rotating standards. The methods and equipment used by the Warren division of the Ohio Public Service Company are outlined here, the illustrations showing the general layout of the equipment.

Owing to the fluctuations of both frequency and voltage, caused by the nature of the load served by the generating station, some means of pro-

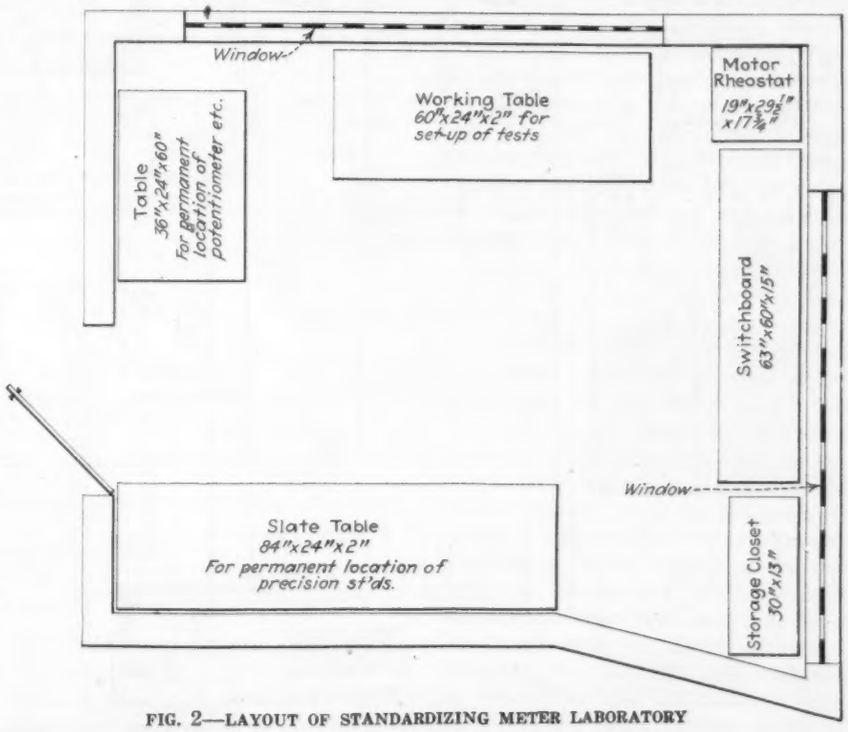


FIG. 2—LAYOUT OF STANDARDIZING METER LABORATORY

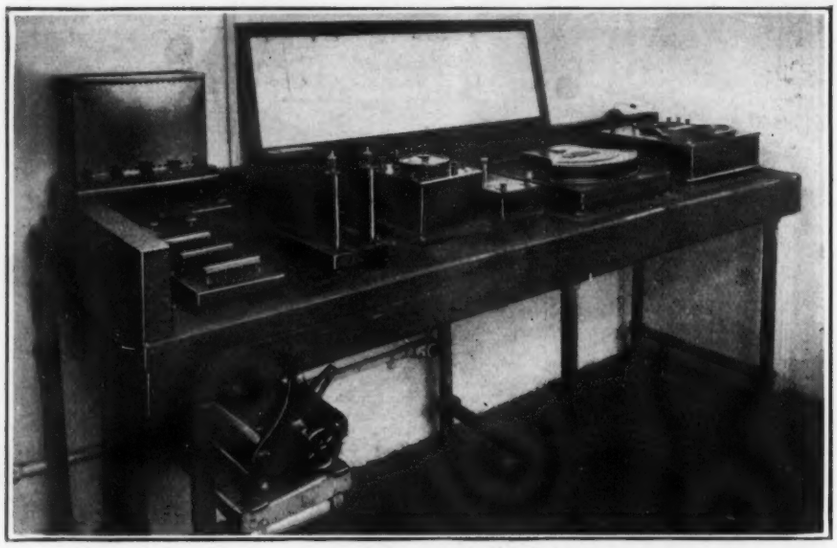


FIG. 3—LAYOUT OF TESTING INSTRUMENTS

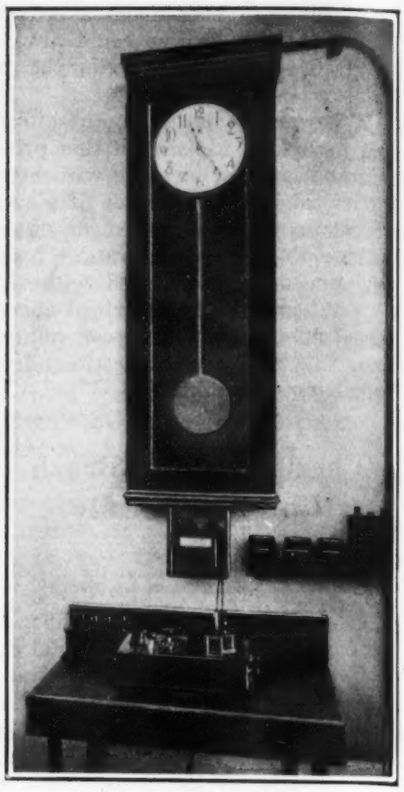


FIG. 4—MASTER CLOCK AND POTENTIOMETER

viding steady voltage for testing was essential. This was accomplished by use of a motor-generator set driven from a storage battery used primarily for switch operation in one of the large switching stations. The test room, being situated on the second floor of this building, provides an ideal location, because it is free from vibration and other disturbing influences.

The motor-generator set used as the source of testing voltages is driven by a 14-hp., 115-volt, com-

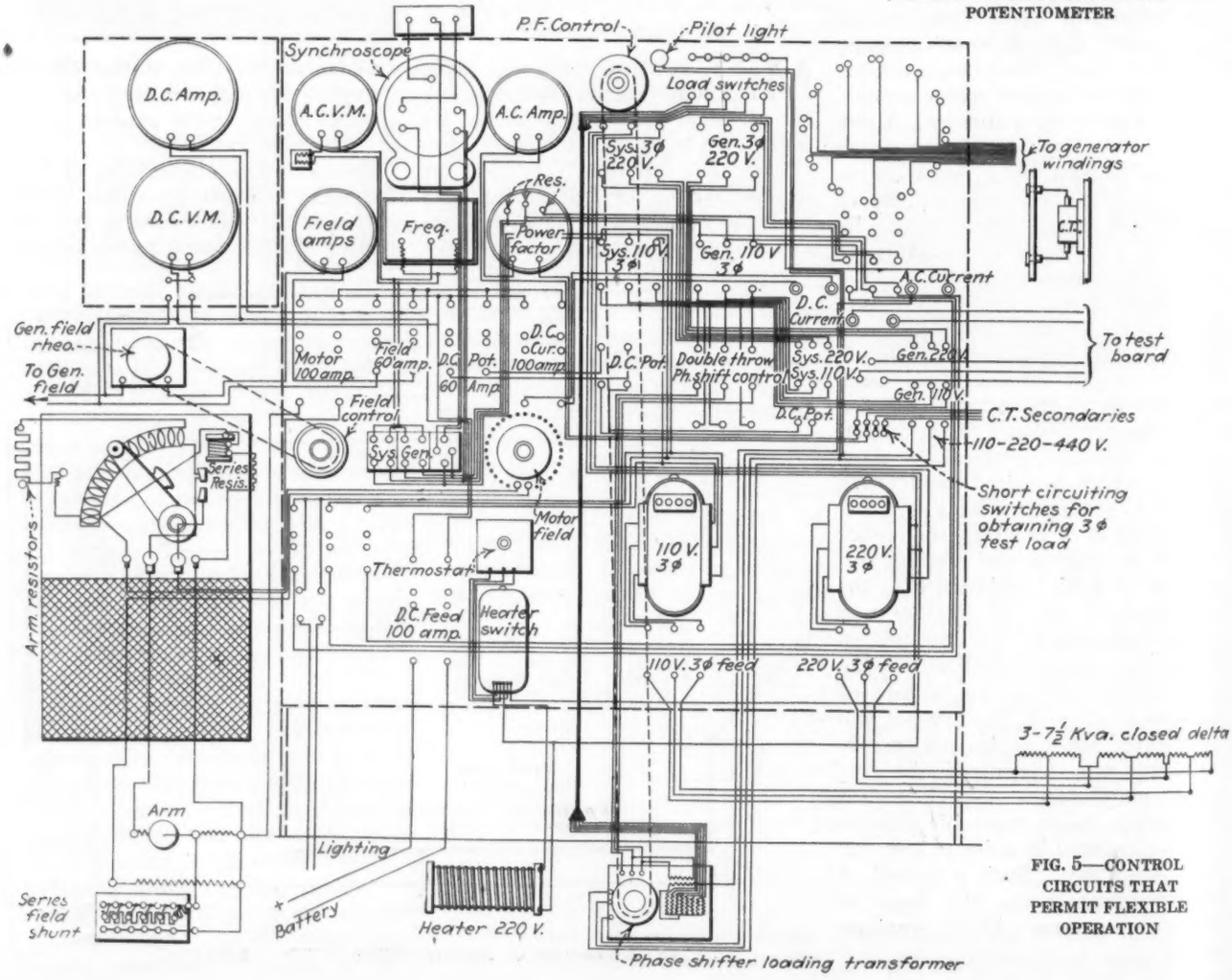


FIG. 5—CONTROL CIRCUITS THAT PERMIT FLEXIBLE OPERATION

pound-wound motor with an adjustable series-shunt to give flat compounding. The speed is controlled by a shunt-field rheostat having a main and interpolating resistance, which gives exceptionally close regulation. The generator, which is rated at 15 kva., 80 per cent power factor, 1,200 r.p.m., sixty cycles, delivers single, three- or six-phase voltages at either 110 volts or 220 volts. These units are mounted on a common bed-plate with a flanged coupling having a ½-in. spacer between halves so that either unit may be operated independently, should this be desirable at any time.

The source of supply being constant, the delivered voltage is remarkably steady and it is possible to make a setting and maintain it without change throughout a test. Control of this set is placed in the test room, where is located the panel shown in Fig. 1. It enables very flexible operation and permits any voltage, either from the motor-generator set or from the system, to be applied to either test table. A jack-and-plug arrangement permits any phase combination to be set up on the control board and be made available to the test tables. It is possible to synchronize the generator with the system and obtain test loads for calibrating power factor, kilovolt-ampere or reactive-volt-ampere meters throughout their range by adjusting the field voltage of the generator for control of power factor and varying the load by adjustment of the shunt-field of the direct-current motor. This provision is of exceptional value in that any condition of metering can be simulated in the laboratory. Relay applications can also be set up experimentally.

The testing instruments, etc., follow the usual practice and are illustrated in Figs. 3 and 4. A master clock controls relays that can be set to open the potential circuits of rotating standards, being calibrated after any desired interval. This arrangement eliminates personal error and, together with the steady supply, obviates the necessity of averaging values on the indicating instruments, thereby making precision tests very easily conductible by one tester.

Distribution for Congested Areas

New York Edison Company Adopts for Bronx District 13,200-Volt, Three-Phase Primary Distribution and 230-Volt, Two-Phase, Five-Wire Meshed Network for Light and Power

THE distribution system of the Bronx district of the New York Edison Company has been the subject of intensive study for some years in an effort to arrive at a definite standard before too much of the system was installed under ground. The Bronx district comprises 19½ square miles, of which three and a half square miles consist of parks, reservoirs, etc., the remaining sixteen square miles being combined residence and industrial districts. This territory is transversed by four main subway or combined subway and elevated lines. The present population is estimated at about 750,000. and the ultimate population is estimated at 2,000,000, or a density of about 120,000 persons per square mile. The southern section of this district and a fringe along the waterfront will probably have largely industrial growth, the remainder of the section being mostly residential of varying classes.

The present primary distribution feeders are radial two-phase, 2,400-volt, four-wire, with two 110-volt, three-wire mains for lighting and separate three-wire mains for two-phase, 220-volt power. Each set of mains is meshed into a network for each individual primary feeder. These primary feeders are of 200-amp. and 400-amp. capacities, the average connected transformer size varying from 5 kva. to 150 kva., with an average of about 70 kva. The installed capacity of distribution transformers is 78,000 kva., and the maximum load approximately 60,000 kva. At the present rate of growth, it is estimated that this load will reach 100,000 kva. by 1930.

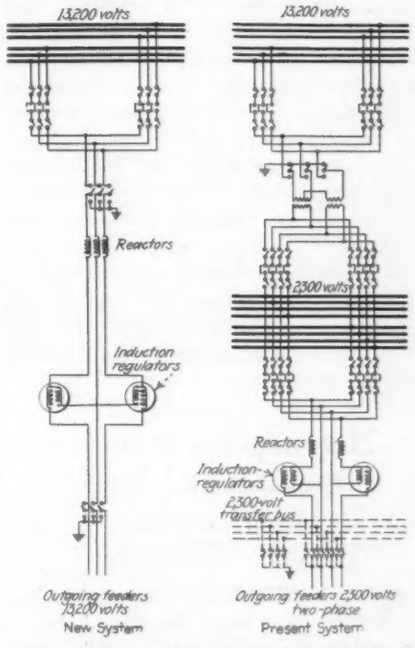


FIG. 1—SUBSTATION ARRANGEMENT FOR PROPOSED DISTRIBUTION SYSTEM

The district is served by four substations, each of which is supplied at 13,200 volts from two independent generating stations, transformation to distribution feeders being through four 6,000-kva. banks in each substation. For purposes of economy and continuity, this capacity of substations has been considered the maximum desirable for supplying a 2,300-volt radial system. The company's studies for a future system considered first the investment already made in 2,300-volt and 110/220-volt, two-phase equipment and the economies that might result from changes to other voltages or phase conditions, on the basis both of retaining as at present and of changing over the existing installations.

One feature that gave excellent results in continuity of service in the past was the practice of repairing grounds on the 2,300-volt feeders without removing them from service. This was accomplished by grounding at the substation, until such work was completed, the leg of any particular single-conductor feeder cable that became involved in a fault. However, with network and network switches, this requirement would cease to exist. A study of networking the present system indicated that due to regulation the present 2,400-volt primary distribution voltage was inadequate to give relief from neighboring substations in the event of a possible shutdown of one substation. The lowest voltage that permitted of this relief through overlapping of substation feeders was 4,100 volts, three-phase.

To change the existing substations and feeders over to three-phase would involve an exceptionally high cost. The 110/220-volt system has a connected two-phase motor load of approximately 50,000 hp., which would require reconnecting for three-phase supply. The change to three-phase, in addition to cost, involved the undesirable features of odd voltages for power of approximately 200 volts. To change over to 4,800 volts, two-phase, would represent still more expenditure in the substations and distribution transformers without

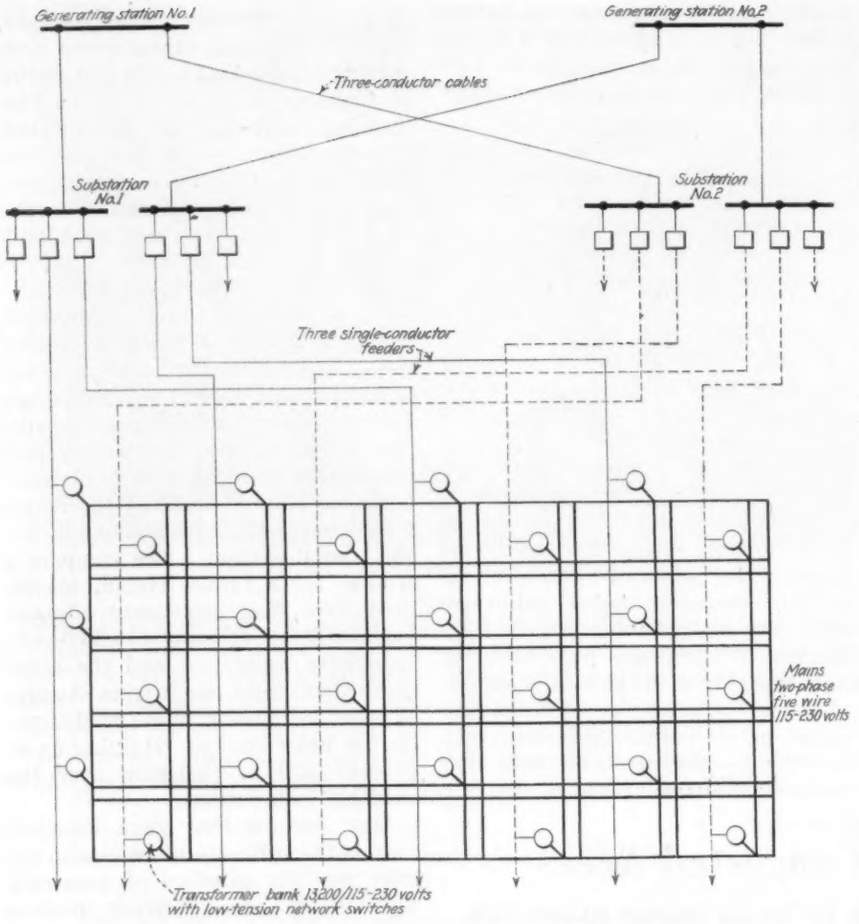


FIG. 2—PROPOSED DISTRIBUTION SYSTEM FOR HEAVILY LOADED DISTRICT

representing a very great change in voltage.

The final consideration, therefore, was to retain the present system, but for all future substations to install three-phase, 13,200-volt distribution feeders. These feeders are to have T-connected transformers for two-phase, 110/220-volt secondary distribution, and are to tie in by networks with the present distribution system. This network system will permit the company to operate at standard lighting and standard motor voltages, motors being two-phase. This proposed system is shown in Fig. 2.

The 13,000-volt feeders fed from at least two generating stations will be overlapped and interlaced so that the respective connected transformer banks feeding the network are alternately supplied by feeders fed from different generating stations. The simplification of the substation circuits for this proposed scheme is shown in Fig. 1, which brings out very clearly the difference between the present and proposed systems. While new 13,200-volt outgoing feeders from present substations will each be equipped with two single-phase regulators for each three-phase outgoing feeder, it is expected that in future substations at least three outgoing feeders will be grouped and supplied through two single-phase regulators, as the increased voltage of these feeders reduces the voltage drop along the length of the feeder, making possible group regulation.

It is also proposed, when this change is made, to raise the existing distribution voltage from 110/220 to 115/230 to conform to the voltage standards of the lamp committee and the electrical apparatus committee of the N. E. L. A.

Mercury-Arc Rectifier Operates 12½ Years

By J. Van Veen
Chief Operator Union Gas & Electric Company, Cincinnati, Ohio

AN UNUSUALLY long operating life has been developed by a mercury-arc rectifier tube which was received at the Camp Washington substation of the Union Gas & Electric Company, Cincinnati, Ohio, on May 23, 1911, and has been in almost continuous service ever since. The tube finally broke Feb. 10, 1925, with a credit of 48,963 hours and 55 minutes to its actual operating time—nearly twelve and one-half years.

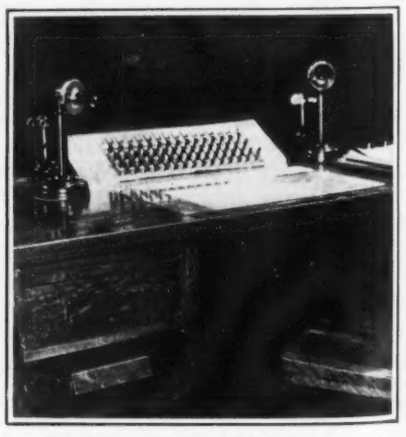
The average life of tubes broken each year since 1915 almost consistently increased, as shown below:

Termination of Life (Year)	Average Life (Hours)	Termination of Life (Year)	Average Life (Hours)
1915....	2,553.00	1920....	4,145.39
1916....	2,809.00	1921....	4,170.77
1917....	3,195.41	1922....	4,428.63
1918....	4,124.32	1923....	5,187.25
1919....	4,476.58	1924....	6,016.20

The average life of the tubes referred to in the table was 4,110.65 hours, although the average life of more recent tubes is fully 50 per cent higher. The tube used at Camp Washington had an operating life nearly twelve times the average in the last ten years and nearly eight times the average for 1924. Judging from improvement in tubes, an average operating life of 10,000 hours may be expected soon.

Convenient Mounting of Telephone Keyboard

IN ITS power houses and important substations the Southern California Edison Company has installed a telephone keyboard on the operator's desk in the manner shown in the accompanying illustration for control of the various lines used for dispatching. With this arrangement only two desk instruments are necessary and the operator is able to keep his desk neat and orderly. By reducing the length of the drawers on each side of the desk to about half and placing panels in the rear, two



TELEPHONE INSTALLATION ON DESK

compartments are provided for installing bells, relays and other necessary equipment. All such installations are in inclosed switchboard galleries, where no sound-proof telephone booth is necessary.

Commercial Activities and Public Relations

Rural Electrical Development in the San Joaquin Valley

Thirty-nine per Cent of System Load and Thirty-five per Cent of California Company's Gross Revenue Are Derived from Agricultural Customers

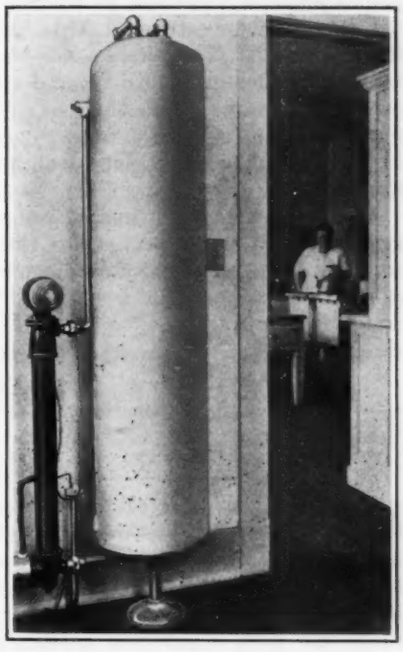
BY M. P. LOHSE
San Joaquin Light & Power Corporation, Fresno, Cal.

BECAUSE of the widespread interest in farm electrification throughout the country, the experience of the San Joaquin Light & Power Corporation with rural electrification in the San Joaquin Valley affords interesting data on this class of service under somewhat unusual conditions which are peculiar to the kind of territory served. This company operates in seven counties of the valley, comprising 25,000 square miles, wherein the development is essentially agricultural.

ELECTRIC PUMPING PLANT IN THE SAN JOAQUIN VALLEY

In the more advanced portions of this area the territory is covered with a network of approximately 5,000 miles of transmission and distribution lines. There are 6,324 farmers served with electricity for pumping irrigation water; 1,052 use electricity for heating and cooking and 9,977 light their homes with electricity. It is estimated that 850 electric pumping plants, 380 heating and cooking, and 600 lighting consumers will be added in this rural territory during 1925. This business brought to the company $2,288,824 in revenue during 1924, which comprises 35½ per cent of its gross revenue. Of the total number of consumers, 29.3 per cent are agricultural, and of the total energy generated, they use 39.3 per cent.

The use of power on California farms has long since passed the experimental stage and it is at present the largest single classification of business on the system of this central station. The analysis of the company's agricultural load, given in Table I, gives a comprehensive idea of the development of this class of business. As the basic industry of the valley is agriculture, the largest apparent future development will be along agricultural lines, and it is not unreasonable to assume that the time is not far distant when the rural load will exceed that of all the other classes of business combined. This rather extensive farm distribution system represents an investment of several million dollars, and that the expenditure has been justifiable there is no question.



ELECTRIC WATER-HEATING INSTALLATION IN A CALIFORNIA RURAL HOME

In past years the company has been making extensions at no cost to the consumer when the estimated revenue for three years amounts to as much as or more than the total cost of the extension. Much of the new load coming on at present is immediately adjacent to existing lines, and accordingly the cost of extending service becomes less.

ELECTRIC PUMPING

This comparatively advanced development of rural service is directly traceable to the fact that a vast

TABLE I—AGRICULTURAL SERVICE, SAN JOAQUIN LIGHT & POWER CORPORATION, 1924

	No. of Consumers	Kw.-Hr. Consumption	Annual Revenue
Pumping plants	6,064	142,800,971	$1,908,882.71
Heating and cooking and small power	1,036	4,214,699	118,644.73
Domestic lighting	9,977	3,377,347	261,296.25
Total	17,077	150,393,017	$2,288,823.69
System total	58,126	382,175,102	6,435,028.46
Per cent of system total	29.3	39.3	35.5

TABLE II—ELECTRICAL IRRIGATION PUMPING DATA FOR YEAR ENDED FEBRUARY, 1925

Consumer months	74,584	Average monthly revenue per hp.	$2.18
Annual consumption, kw.-hr.	143,765,956	Average annual revenue per hp.	$26.16
Annual revenue	$1,917,506.69	Average annual rate per kw.-hr.	$0.0133
Horsepower months	877,792.77	Annual load factor, per cent	30
Average number consumers per month	6,215	Average pumping plant, total lift estimated, feet	42
Average kw.-hr. per consumer per month	1,927	Average pumping plant over-all efficiency, per cent	45
Average connected load hp. per consumer	11.76	Average pumping plant delivery, gallons per minute	500
Average monthly revenue per consumer	$25.71	Kw.-hr. per acre-foot pumped, based on averages	95.29
Average annual revenue per consumer	$308.52	Acre-feet electrically pumped, 1924, based on averages	1,508,720
		Power cost per acre-foot pumped, based on averages	$1.27

amount of the irrigable land is served with pump water. Electricity has proved to be the most economical power for operating pumps and consequently its use has become general. The revenue received from pumping plants alone is sufficient to warrant the necessary investment. This has made electricity available to the farmer for domestic, utility, and all other purposes. An analysis of pumping plant service data is given in Table II, for the San Joaquin system.

Following are the principal crops grown in the area served by this company, with the maximum amount of water necessary for average soil irrigation duty:

	Acre-feet		Acre-feet
Alfalfa	5	Orchards	2½
Grain	2	Truck garden (Double cropped) ..	4½
Cotton	3½		
Vineyard	3		

From the character of the irrigation load demands, it is evident that most of the watering comes in the five summer months, April to August inclusive. Of late years, however, there has been a growing tendency to irrigate during the winter months, a practice that is increasing very rapidly with the proof of its value in increasing production. This fact is tending to decrease demand and improve load factor.

The rate schedule is set up on a demand and energy basis. As a result, better load factor and lower demand materially reduce the unit cost of power. This condition is of distinct benefit to the farmer, and is improving the central station's operating balance. For the total area served by the company, it seems that three acre-feet per year would be a reasonable average application. It follows, therefore, that the water electrically pumped is sufficient to care for 500,000 acres. Much of this water, however, is used to supplement the irrigation district's canal supply. It is therefore probable that the actual area served is more nearly a million acres.

Company's Appliance Sales $8.27 per Customer

DURING 1924 the Pacific Power & Light Company, serving fifteen districts in Oregon and Washington, carried on four major appliance campaigns in addition to the regular merchandising activities of the district offices. These efforts resulted in the gross sale of approximately $208,100 worth of appliances, divided as follows:

	Quantity Sold	Approximate Gross Sales
Kitchen lighting units.	1,914	$13,400
Vacuum cleaners	407	23,000
Electric ranges	248	38,500
Electric washers	558	79,500
Domestic refrigeration .	12	3,200
Electric ironers	31	4,800
Miscellaneous appliances	3,233	45,700

A kitchen-lighting campaign was put on from Jan. 15 to March 1, a vacuum cleaner campaign from April 1 to May 1, a range and water heater campaign from May 1 to July 1, and a washing machine campaign from Sept. 15 to Oct. 15.

The company's gross merchandising and jobbing business for 1924 came within less than 1 per cent of equaling that of 1923. Appliance sales in the company's fifteen districts averaged $8.27 per consumer. The percentage of sales adjustment was 9.4 per cent. It is felt that this is higher than it should be, and beginning with this year each district is being supplied with a detailed analysis of merchandising operations by districts. The percentage of district expense to gross sales averaged 13 per cent. Net profit on all sales averaged 4 per cent. Turnover in the various districts varied from 0.82 to 5.25 and averaged 2.05. Many of the district offices are located at some distance from jobbing centers and the turnover is naturally low.

The Ideal Power Salesman

Qualifications and Characteristics of Men Upon Whom Rests the Responsibility for Developing the Central-Station Company's Industrial Power and Heating Load

BY H. H. HOLDING
General Power Representative Public Service Electric & Gas Company, Newark, N. J.

THE widely heralded era of "super" and "giant" power, which is to produce a veritable Utopia for mankind and which is almost upon us—if we can believe the advance agents—serves to call to the mind of the central-station manager that he has a problem which is here in his midst now. He has a heavy responsibility in the large investment made in the last few years upon which his directors are looking for returns to pay fixed charges and stockholders are expecting dividends.

This new investment must be kept working and therefore new business must be found. Salesmen competent to cry the central-station company's wares are not plentiful and must be developed from material at hand.

After a great many years spent in supervising the sale of thousands of horsepower in connected load of industrial power and with many more thousands of horsepower to be sold, the writer has, from years of observation, crystallized what might be considered as the requisite qualification and character of an ideal salesman. Of course the word ideal has been rather overworked, as has also the word "super," but perhaps we could paraphrase and compound our ideal into a "super-power salesman."

This salesman should have a certain education and training. He should be able to think and speak, if necessary, in scientific terms. A technical education and training is necessary — a mechanical, electrical or civil engineering course. The desirability is in the order enumerated. This education, whether it be university, college or correspondence school, should be accompanied or followed by practical experience in a diversified industrial application of the electric motor. The man not only should be familiar with the theory of the motor and control apparatus but should have had actual experience in installation and operation of such equipment. He should know how to lay out a wiring system and be familiar with underwriters' rules. He should know something about production in a factory and the relation of power to production.

As a salesman he should possess a natural ability of salesmanship or else develop that very important characteristic. A course in scientific salesmanship is often helpful. He should be a gentleman in all that the word implies. He must be careful in his dress and personal appearance, but not fastidious. He should not wear light-colored spats or carry a cane when he is on duty, unless he is lame. He should not fear to soil his hands or put on overalls if occasion demands.

The old style salesman is no longer in vogue, but some of the tricks of his trade are worth while even now. The word "tricks" is used figura-

tively only, for there is no place in modern salesmanship for trickery or misrepresentation. Our ideal salesman should be honest "to the core." He must have a personality that will inspire confidence, and this must be backed up by a knowledge of the goods.

After the power salesman has been in an industrial territory for a time he should become a specialist, because industries of like or allied nature are usually located in the same community. As a specialist he should know a little more about the use of power in the industry that predominates in his territory than the managers of the factories themselves. In fact, the power salesman should know processes and the application of power to such processes and the necessity for heat and its application, if heat is necessary. He should know something of electrochemistry and metallurgy, at least enough to talk intelligently to the factory manager. The power salesman will find it advantageous to be familiar with artificial light and its uses in the factory.

He should have a knowledge of figures and a general idea of the use of accounting and cost keeping. He should know how to route materials and the most economical way of handling them, whether by electric industrial truck or belt or other types of conveyor.

Being an outsider in his negotiations with power users, he may be allowed to suggest changes in processes of which the man close to the work would never think. He, therefore, must be ingenious, have a lively imagination, but not be too theoretical. He must be practical above all things. He must know the elements that make up unit power costs. Being an engineer, he must know the effect upon total power costs in the private plant should processes or other conditions change. He should know how to determine the elements of cost if the cost-keeping methods prevailing do not bring them out in analysis.

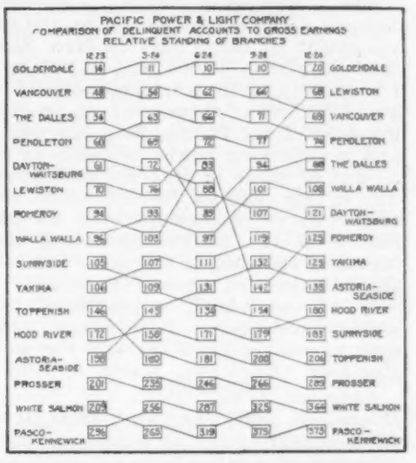
Oh, yes, analysis should be his strong point and he should be able to make a report that is concise yet convincing. His reports should have a summary that "he who runs may read." Probably the most important of all should be his knowledge of the value of money and his ability to talk to the men responsible for invested capital. Such terms as "depreciation," "amortization," "fixed charges," "unit costs," "investment costs" and so on should be well understood as to their effect upon power costs.

A knowledge of central-station rates and rate practices is of great importance. He should be able to defend the rate structure of his company even before the public service commission. He should be able to suggest to his executives constructive changes in rates when such changes will obtain additional business without discrimination or loss of existing revenue. He should acquire ability to read human nature and judge accurately the points in a negotiation that should be stressed and when and how to present them most effectively.

The "ideal" is not impossible of attainment, as are some ideals. In fact, there are a number of such men in the industry, although some of them have been promoted to the executive staff, as is their due. But with the growth of industrial heating and power applications more such men are needed and as the industry continues to grow so will the reward for services rendered by the super-power salesman.

Checking Up Delinquent Accounts

EACH quarterly period the Pacific Power & Light Company, with main offices in Portland, Ore., publishes a chart like the one here reproduced, to show the delinquent accounts in its fifteen districts. It has been found that this aids the district managers in keeping a check on the delinquencies in their own district and at the same time serves as a stimulus to make a better record than that of other district offices.



COMPARISON OF DELINQUENT ACCOUNTS TO GROSS EARNINGS AND RELATIVE STANDING OF DISTRICT OFFICES

For the entire system the delinquent accounts for 1924 amounted to 1.55 per cent of the gross revenue. While this is not as good a showing as had been hoped for, it is recognized that the ratio of delinquent accounts to gross revenue is really a business barometer and merely reflects the poor conditions that prevailed in the agricultural territory served by the company during the last half of 1924.

Electric Home Making Taught in High School

FURTHER evidence of the increasing public interest in the application of electricity to the home may be seen in the above view of an electrically equipped domestic science classroom of the Kerman Union high school, Fresno County, California. More and more cities are recognizing the need for teaching the present-day school children the proper use of electric household conveniences, and this is but one of many similar installations that are being made in the public schools throughout the country.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

The Mangahao Hydro - Electric Scheme.—The plan contemplates the development at three sites in New Zealand of 24,000, 40,000 and 96,000 hp., respectively, with transmission at 110 kv. The first of these, with an operating head of 825 ft., has been completed and is delivering power to distances of 25 and 63 miles in different directions. The article outlines the difficulties encountered in construction due to the nature of the stream controlled, the layout of the station and some data on the transmission lines. It includes a map of the island, a profile of the entire development, involving a total drop of nearly 1,000 ft., and views.—*Engineer* (*England*), March 6, 1925.

Sherman Island Dam and Power-House.—H. DEB. PARSONS.—This paper describes very fully the design and construction of a dam and power-house on the Hudson River, near Glens Falls, N. Y. The plant is to have an ultimate installation of five 10,000-kw. units, under a normal head of 66 ft.; four are now in operation. Data are given on the hydrology, and the geological conditions which necessitated construction on pervious material which caused an uplift pressure, as well as the methods adopted to meet these difficulties, are reported. Measurements of movement of the dam were made during construction and subsequently, and of the uplift after the pond had filled.—*Proceedings of the A.S.C.E.*, March, 1925.

Roller Gates Make Up the Major Portion of Powerdale Dam.—J. E. YATES.—To meet conditions including variations of stream flow between 300 sec.-ft. and 30,000 sec.-ft., with enormous quantities of silt, gravel and boulders carried in floodwaters, the concrete of this low-head dam on the Hood River in Oregon is for the greater part of its length carried up only to stream-bed level. The cylindrical gates forming the actual barrier can be raised to permit a practically unobstructed flow. Their construction is described and illustrated.—*Engineering News-Record*, March 19, 1925.

Generation, Control, Switching and Protection

Evaporative Tests at River Rouge.—Data are tabulated for five tests with pulverized coal for sustained boiler loads up to 285 per cent of normal rating. The article is of further interest because of its discussion regarding such matters as high temperatures of the furnace walls, slagging and troublesome pulsations.—*Power Plant Engineering*, March 1, 1925.

Parallel Running of Alternators.—G. WINDRED.—The paper is a discussion of the article by Frith and Buckingham on the same subject in the *Electrician* of Feb. 27 and March 6, recently noted in the Digest. The author suggests that simpler mathematical methods could be used for finding the magnitudes involved in the oscillations of a machine running in parallel with others and develops equations for the control factor, synchronizing power and number of swings per minute. The treatment rests on simple mechanical and electrical relations and is purely algebraic.—*Electrician* (*England*), April 3, 1925.

Electrical Features of Long Beach Station.—A reference to a description of constructional problems encountered in the erection of this plant of the Southern California Edison Company, and of the steam equipment, was recently given in the Digest. The present article similarly describes and lists the principal electrical equipment.—*Power Plant Engineering*, March 15, 1925.

Transmission, Substations and Distribution

Improvement of Power Factor.—MILES WALKER.—Part II.—In this installment the author points out the advantages of using phase advancers. He first shows that an induction motor designed for operation with an advancer can be made appreciably smaller than would otherwise be the case, and he illustrates this by a table of comparative data for a 1,250-hp. 375-r.p.m., 6,000-volt, 50-cycle machine, and shows a net saving in copper, including that in the advancer, of 205 lb. There is also a reduction of motor losses from 46.8 kw. to 43.2 kw. at full load (leaving a contribution of 3.6 kw. toward the losses in the phase advancer), though 400 lb. more iron is required. This requirement, however, could be reduced by a permissible decrease in the diameter. After phase advancers have become standardized by manufacturers and the cost of manufacture brought down to the same figure as for direct-current machines it is probable that small motors can be economically fitted with these power-factor improvers. An estimate is also given of the saving possible if there is a charge based on maximum kva. demand. Where phase advancers cannot economically be used the alternative seems to be static condensers. A table shows that the present-day (British) prices for 100-kva., three-phase units with switchgear are around £300, the exact figure depending upon the voltage. Finally, the power factor could be increased and the losses reduced if transformers were operated in banks controlled by automatic switches to throw the larger units off and on, according to load.—*World Power*, March, 1925.

Losses in Transformer Substations.—A. DELLA RICCIA.—Particularly in rural communities, the demands upon the supplying transformer substation are exceedingly seasonal. Statistics have shown that the output of such stations is on the average less than one-eighth during 8,000 hours out of 8,760 hours in the year. To have one transformer of a capacity to satisfy the maximum demand means large no-load losses. It is the purpose of this article to show the great economy of transformer stations wherein the required maximum capacity is installed in two units in parallel, one to be 15 per cent and the other 85 per cent of the total, these two transformers to be operated by an automatic switch. For example, a 5-kw. and a 35-kw. transformer are installed in a station with a nominal rating of 40 kw. In spite of the higher investment represented by these two transformers as against one 40-kw. transformer, and in spite of the considerable cost of the automatic switching mechanism, the annual savings in the cost of excitation current are very considerable. A mathematical method is given to determine the most economic solution of such installations.—*Revue Générale de l'Electricité*, April 11, 1925.

Units, Measurements and Instruments

Investigation by Electrolytic Means of the Magnetic Leakage of Salient Poles.—Part III.—A. A. AHMED.—The author compares the leakage permeance for a given structure calculated according to the two-dimensional method of treatment with the results by his experimental method. His conclusion is that the method of slicing up the leakage field normally to the pole axis is fundamentally incompatible with actual conditions and therefore unsatisfactory. He then lists certain suggestions for an alternative method, but states that the mathematical difficulties would render the solution too complicated for practical use. He therefore offers simplifying assumptions, of which application will presumably be made in the next installment.—*World Power*, March, 1925.

Permanent Magnets.—S. EVERSHED.—A two-page abstract is given of the author's paper read at a recent meeting of the Institution of Electrical Engineers. The metallurgy of magnetic steel is discussed, and the effect of various solutes such as carbides of iron, tungsten and chromium is explained as endowing the iron with "potency." By this term the author proposes to designate the property of steel to retain magnetism (which he says is there, whether the steel is actually magnetized or not) as distinguished from Hopkinson's definition of "coercive force," which is the demagnetizing force necessary to reduce its magnetism to zero. Other topics are the nature of spoiling by heat in the temperature range from 750 deg. to 1,214 deg. C., what goes on after the upper boundary temperature, reasons for the decay of hardened steel, comparison of the qualities of tungsten, carbon and cobalt steel, with costs and causes of aging.—*Electrician* (*England*), April 2, 1925.

Illumination

Ocular Principles in Lighting.—C. E. FERREE and G. RAND.—This paper lies in the field of the physiology and psychology of vision. The following points are covered: A brief survey of the development of lighting in relation to the eye; a statment of the problems involved; reasons for the failure of earlier attempts to solve these problems; the factors in lighting and an analysis of the act of seeing; the visual functions affected by each of the

lighting factors; tests devised for the study of the effects on the eye; the results obtained with these tests and their bearing on the problem of lighting; an explanation of the effect of each of the lighting factors on the powers and welfare of the eye, and a discussion and explanation of the casual relation of lighting to the abnormalities of the eye. Other features are a discussion of eye strain and a comparison of the results of laboratory tests with those of an ophthalmic survey of the employees of the New York City Post Office by the office of industrial hygiene of the United States Public Health Service. — *Transactions of I. E. S.*, March, 1925.

Display-Case Lighting in Stores.— J. L. STAIR and WILLIAM FOULKS.— *Daytime Illumination in Show Windows.* — WARD HARRISON and WALTER STURROCK.—*Electrical Sign Design.*— C. A. ATHERTON.—These three papers were presented at the annual convention of the Illuminating Engineering Society, October 27-30, 1924. Abstracts may be found in the ELECTRICAL WORLD report of the convention, Nov. 1, 1924, on page 961.—*Transactions of I. E. S.*, February, 1925.

Motors and Control

Polyphase Induction Motors.—M. P. KOSTENKO.—Economical speed control of polyphase induction motors with constant frequency is possible only with great complications in the construction and only in very narrow limits. By regulating the frequency and tensions on the terminals of the induction motor, its speed can be controlled in a very large degree without any loss of efficiency. The author states that if the tension is directly proportional to the frequency and inversely proportional to the square root of the torque on the shaft, the motor will work with practically constant coefficient of stability, power factor, absolute slip and maximum possible efficiency. For making this method of speed control possible the motor should be fed from a special generator, for which purpose a variable frequency alternating current compensated commutator generator with independent excitation of alternating current and constant number of revolutions can be used. The following three cases are discussed: (1) The torque is inverse proportional to the frequency. (2) The torque is constant. (3) The torque is proportional to the square of the frequency. Numerical examples are given for each case. The paper is mathematical throughout. — *Electritchestvo*, No. 2, 1925.

Synchronous Condenser Installation. —A. E. BELLAN.—A French cable-manufacturing plant having an installed motor capacity of 2,500 hp. operated with an average power factor of 67 per cent. Buying its electric power, a high rate had to be paid on account of the great phase displacement. It was therefore decided to install a synchronous-condenser equipment, for which a 1,000-kw., 1,000-r.p.m. set, directly connected to the incoming 5,500-volt, three-phase feeder, was chosen. The motor is started as an asynchronous squirrel-cage motor with a compensator, having one-third, two-thirds and full voltage taps. The excitation on the condenser is automatically adjusted in accordance with the load on the lines to maintain practically unity power factor. The economy of this set can best be seen from the following data:

	Francs
Cost of installation	96,000
Depreciation, 10 per cent	9,600
Upkeep	1,900
Energy consumption	52,500
Annual savings in energy	113,500

At the end of the first year the investment was not only paid for, but a net profit of 17,500 francs was realized.— *Revue Générale de l'Electricité*, April 11, 1925.

Electrophysics, Electrochemistry and Batteries

Dust Precipitation. — E. OPPEN. — High current consumption of the hitherto known dust - precipitation methods makes them profitable only in cases where the value of the caught dust material is high, such as, for example, lead dust. The present short article describes a newly introduced precipitation system, called "Oski," wherein plates made of semi-conducting cement act as cathodes, while metallic plates between them supply the positive charge to the gas stream. The cement plates distribute the charge very evenly, causing apparently a smaller consumption of energy. A large number of German cement mills have already been equipped with these new precipitators. In one of these plants as much as two tons of cement dust is abated per hour.—*Der Elektrische Betrieb*, March 10, 1925.

Purification of Water by Means of Electric Current.—A. ABRAMKIN.—It is found that by passing electric current through water, by means of iron electrodes, the content of different salts diminishes appreciably. This is due partly to direct electrolysis, partly to more complicated electrochemical reactions, resulting in the formation of the precipitates. This method was worked out and applied for purification of water used for boilers at the electric station of Shatoura (near Moscow). The paper is illustrated with several diagrams.—*Electritchestvo*, No. 2, 1925.

Magnetic Analysis.—T. SPOONER.— Various methods have been devised for determining the physical properties of ferrous materials due to composition and heat treatment, and particularly the presence of flaws, by applying magnetic tests. These are passed in review and curves reproduced showing correlations that have been found to exist.— *Electric Journal*, March, 1925.

Heat Applications and Material Handling

Essentials of Design of Electric Industrial Furnaces and their Application to Leveling Up Load Curves.—GEORGE P. MILLS.—Advantages of the electric furnace as against furnaces fired by fuel are said to be (1) improved quality of product, (2) improved working conditions and (3) lower over-all cost of production. The last-named is analyzed. Especially where labor is an important item of cost, the saving is marked. Several striking instances are cited. Low power rates are contingent upon keeping off the peak of the load curve. By means of typical shop-load curves it is shown that much energy could be taken without increasing the maximum demand. The use of timing devices and power governors is suggested. Several types of furnace design are shown, and advantageous and disadvantageous features are noted.— *Iron and Steel Engineer*, March, 1925.

Double-Head Welder Cuts Wheel Maintenance.—A. C. COLBY.—The average cost of welding and grinding 34-in. and 26-in. car wheels in Detroit is given as follows, exclusive of overhead: Welding labor, $1.55; grinding labor, 98 cents; welding wire, 45 cents; energy, 54 cents—a total of $3.52. The economy, as compared with turning, lies in the increased life obtained—because very little metal is taken off to true up the wheel—rather than in a lower cost for the operation.—*Electric Railway Journal*, March 21, 1925.

Traction

Electrification of Paris Suburban Railways.—The article contains a brief historical account of the development of suburban traffic, followed by data in considerable detail on the rolling stock, with a map of the territory served. Direct current is furnished at 650 volts through a heavy third rail (virtually 152 lb. per yard), but the electrical equipment can be used at 1,500 volts if that shall later appear desirable. The latest motor cars weigh only 57 tons and are to be used each with a trailer in two-car units, the trailer having control at the far end so that the combination is double-ended.—*Electric Railway Journal*, March 7, 1925.

Maintenance of Electric Railway Equipment and Track.—Almost the entire issue is devoted to illustrated articles on various phases of maintenance. The one describing methods on the Interborough takes up the nature and extent of the repair problem, methods in carrying out repairs and the organization by which this work is conducted in the shops. Other articles deal with armature repairs, line maintenance and organization. — *Electric Railway Journal*, March 21, 1925.

Telegraphy, Telephony, Radio and Signals

Theory of the Wireless Beam.—B. H. WHITE.—The paper explains in non-mathematical form the directive effect of a single tuned aërial a quarter wave length distant from the transmitting aërial and then extends the explanation to the case of a group of such wires arranged in a parabola. In the second part several stations using beam transmission are described. — Hendon, Inchkeith and Poldhu. — *Electrician (England)*, April 3 and 10, 1925.

Voice-Frequency Carrier-Telegraph System for Cables.—B. P. HAMILTON, H. NYQUIST, M. B. LONG and W. A. PHELPS.—This is a non-mathematical paper describing a system specially adapted for operation on long four-wire cable circuits, ten or more telegraph circuits being obtainable from one four-wire circuit. — *Journal of A. I. E. E.*, March, 1925.

Scientific & Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Ionization by Electron Impacts, Evidence Regarding the Process of

Thermodynamical considerations suggest that the primary effect of impacts of electrons against molecules is excitation which may be followed by a secondary process of disintegration (ionization). Smyth and Barton have proved the secondary nature of some such disintegration processes by the method of positive ray analysis. We have obtained further evidence of this process, and also of a contribution to the total ionization due to collisions of the second kind by highly excited molecules. Electrons with controlled speeds were projected into a metal cylinder containing an electrode system of small area for collecting positive ions produced by ionization within the cylinder. A sharp increase in ionization was found at twice the minimum ionizing potential in all gases (A, Ne, He, Hg, N_2 H_2), although the gas pressures were so low as to render negligible any ionization which could be ascribed to those electrons which, after ionizing one atom, might retain their excess energy and ionize another. The observed extra ionization was, in various tests, from 50 to 600 times too large to be attributed to electron impacts under any conceivable conditions. It is explained by ionization at collisions of the second kind between neutral and highly excited molecules.—*K. T. Compton and C. C. Van Voorhis, Princeton University, N. J.*

Pumps, Centrifugal, for Oil

An extensive investigation has been made by Prof. R. L. Daugherty of the California Institute of Technology to determine the variation in the characteristics of the centrifugal pump with liquids of different viscosities and vapor pressures. Aside from tests with water as a standard, the commodities used were oils of different viscosities; the primary object of the tests being to determine the head, capacity and efficiency of a centrifugal pump as a function of the viscosity of the liquid handled by it. It was also desired to find the effect of a variation in the vacuum in each case and to determine the limit of vacuum under which each commodity could be pumped, the physical property involved being the vapor pressure.—*Bulletin 126 of the Goulds Manufacturing Company, Seneca Falls, N. Y.*

Silica, Fused, Thermal Expansion of

The Bureau of Standards has completed measurements on the thermal expansion of representative samples of fused silica (fused quartz) between minus 125 deg. C. and plus 1,000 deg. C. This research was undertaken to obtain data on fused silica for use in thermostats, clock pendulums, length standards, pyrometers, gas-sampling devices, acid-resisting articles, insulating and temperature-resisting devices, etc. The expansion curves show very interesting results at low temperatures. For each sample a critical temperature (or minimum length) was found. On heating above this temperature the material expands, but on cooling below this temperature, expansion (instead of contraction) takes place.—*Bureau of Standards, Washington, D. C.*

Synchronous Motor with Magnetic Clutch

The stationary part is identical with that of the standard synchronous motor. The rotor, however, is not keyed to the shaft, but is free to move on a bearing carried by the spider. The field member of the clutch is bolted to the spider, while its armature or driven half is mounted on a hub, keyed to the drive shaft. When starting, reduced voltage is applied to the machine, bringing the rotor up to speed quickly, while the drive shaft remains stationary. When the rotor reaches synchronous speed, the field is excited and line voltage is applied to the stator. The clutch coil is then excited, drawing the two halves of the clutch together, and the load is brought up to speed.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

Transformers, Three-Phase, Five-Legged

A three-phase transformer costs less, occupies less space and has a higher efficiency than three single-phase units. On the other hand, with the usual three-legged construction, the magnetic circuits are unbalanced and there may be difficulties due to surging when switching, or in open-delta operation. In order to balance the magnetic circuit, two more core legs have been added, one on each side, so that the transformer is magnetically equivalent to three single-phase units.—*Pittsburgh Transformer Company, Pittsburgh, Pa.*

Welding Cast Iron with Bronze

A special alloy of copper and zinc, with small amounts of iron, manganese and tin, has been developed for welding cast iron. The advantages are: rapidity, small amount of preheating, ductility of the weld, and easy union with cast iron without melting the latter. For details see S. W. Miller in the *American Welding Society Journal*, 1925, Vol. 4, No. 3, page 36.

Wire, Fireproof Insulation for

Fireproof insulation for telephone switchboard wires is made possible by a new use recently discovered of selenium. The peculiar thing about the use of selenium for this purpose is that the element itself can be burned. Only when it is used on the cotton covering of the wires does it take on fireproof qualities. The wire resists all ordinary flames and even when ignited by the intense heat of a blow-torch goes out immediately when the outside flame is removed.—*Science Service, Washington, D. C.*

In Progress or Purposed

Conductivity, Electrical, of Liquids with Suspended Particles

A series of experimental investigations is being made on the electrical conductivity of liquids with suspended homogeneous fortuitously distributed polarizable spheroids. A general theory has been developed and various practical applications will follow. The first results, on the determination of butter fat in milk and cream, have been published in the *Physical Review*, 1925, Vol. 25, page 361. A similar investigation of blood is to follow.—*Hugo Fricke, Cleveland (Ohio) Clinic Foundation.*

Hydro-Electric Units, Reliability of

Data are being compiled on the "outage" time—that is, the part of the year during which a unit is out of service on account of hydraulic, mechanical or electrical trouble, or maintenance and inspection.—*R. L. Thomas, Lexington Bldg., Baltimore.*

Overhead Systems, Study of

The following subjects for study have been assigned to the various geographic divisions of the overhead systems' committee of the N. E. L. A.: life of treated and untreated poles; methods of tree trimming; design and use of steel poles; transformer loading; various methods of grounding; pole supply of Canada.—*W. G. Kelley, 72 West Adams St., Chicago, Ill.*

Transmission Lines

Analytical studies have been made of the effect on stability of the characteristics of generators and of various types of system loads, and also the effect of intermediate condenser stations. These investigations have included not only steady state, but also transient conditions of switching and short circuits. The desirable characteristics of generators and synchronous condensers, from the standpoint of stability, have been analyzed. Hand in hand with the analysis of these superpower problems have gone the study and development of protective apparatus for telephone circuits, power lines and single-phase railways.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

Turbine Materials, Strength at High Temperatures

Extensive research is being undertaken to determine the effect of high temperature on the resistance of turbine materials to tensile and vibrating stresses, also to determine the most effective methods of group blading construction to secure greatest durability under conditions existing in actual operation.—*Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.*

Wire Rope, Non-Destructive Testing of

Work has been started on the effect of repeated stress on the magnetic properties of steel wire. This is to determine whether or not the progress of a fatigue failure is accompanied by a corresponding progressive change in magnetic properties. The results so far obtained appear to indicate that this is not the case. Some experiments have also been made to determine whether or not alternating-current methods for testing will be more satisfactory in practice than the direct-current methods heretofore used.—*Bureau of Standards, Washington, D. C.*

Suggestions for Research

Communication, Measurement of Distortion of

Methods are available for the measurement of distortion of a pure sine wave of a desired frequency as it passes through modulators, amplifiers, etc. The quality of actual reception of speech or music, whether over radio or wire, depends upon the combined distortion of a wide range of frequencies. Some empirical method is needed for expressing the over-all quality of received message quantitatively.

Motors, Inclosed, Air-Cooled

A foreign manufacturer has placed on the market a line of totally inclosed electric motors with a double casing, the cooling air being circulated between the two casings. It is claimed that in this manner the size and the weight of a machine may be reduced almost to that of an open motor of the same ratings. Tests are desired to establish the advantages and the disadvantages of this solution of the problem of the inclosed motor.

Network Protectors

With the development of low-voltage distributing alternating-current networks their protection against serious interruption in service has made it necessary to use some automatic protector for disconnecting and isolating a defective transformer or feeder. Most of the proposed devices have been used only a short time or in a limited territory, and a systematic study is desired with the view to selecting the best arrangement for universal use. For a description of some of such devices see N. E. L. A. Report No. 25-1.

Shafts, Whirling of

Irregular behavior of shafts in high-speed machinery is a source of some annoyance, and it is desirable to supplement theoretical considerations, such as critical speed, etc., by direct tests. To be of value the results should include actual curves described in space by a point of the shaft, because an analysis of such a curve will give information about the unbalanced forces acting on the shaft. An arrangement of a high-speed motion-picture camera for such a test has been described by Dr. B. L. Newkirk; see *Optical Society of America, Journal*, 1924, Vol. 9, page 607.

Speed Regulation by Series Exciter

In the *General Electric Review* for January, 1925, page 26, an improved system of speed control of elevator motors is described, involving a motor-generator controlled on the Ward Leonard principle with an auxiliary series exciter for compounding. It is also stated that this system appears to have possibilities for other applications requiring a very wide range of speed control and rather close speed regulation at the various speeds.

Vehicular Tunnel, Lighting of

A large vehicular tunnel is being built under Hudson River between New York and New Jersey, and other similar tunnels will probably be designed in the future to accommodate the ever increasing automobile traffic. Proper lighting of such tunnels is a new problem and offers a considerable field for investigation. For some information on this subject see *Transactions of I. E. S.*, September, 1924, page 647.

News of the Industry

N.F.P.A. Adopts Amendments to Code Without Change

At the annual meeting of the National Fire Protection Association in Chicago on May 13, the report of the electrical committee on amendments to the 1923 National Electrical Code was adopted as a whole. This report had previously been submitted to a ballot of the committee of thirty-nine members, of whom thirty-one voted affirmatively on the report as a whole and eight did not vote. The amendments as adopted will be incorporated in the 1925 edition of the National Electrical Code as an "American standard."

Few changes of wide importance were made, the main revision being editorial. A discussion of the principal changes made appeared on page 486 of the ELECTRICAL WORLD for February 28.

Reports were also made at the convention on electric railway carhouses and cars and on protective signaling systems and municipal fire-alarm systems. W. J. Canada, recently appointed electrical field secretary for the National Fire Protection Association, addressed the convention, emphasizing the importance of uniformity and elimination of waste in the enforcement of the code.

Twenty Millions May Be Spent in St. Maurice District

Addressing a meeting in Montreal, Premier Taschereau of Quebec told of a proposal said to have been made to him recently by J. B. Duke for the development of the St. Maurice district, involving an expenditure of $20,000,000. One of the stipulations was that no power was to be exported from the province.

Dealing with the power export question, Premier Taschereau said: "If you send power to the United States, it will be to build up the towns and cities of that country, and when they grow and have greater needs, how can you say no to their demands? The cost of coal is getting higher, there are strikes in the coal fields, there is the cost of transportation, and the trend is toward a general use of electricity by industries. And are we to go on building up American industries to compete with the industries in our own province?"

At a political gathering in Ottawa on May 6 Howard Ferguson, Premier of Ontario, again attacked the export of power from Canada and made special reference to the proposed development at Carillon. He asserted that Ontario had riparian rights and protested against any lease to an outside corporation. In any event, Mr. Ferguson declared, there was not 400,000 hp. at Carillon, as advocates of the plan asserted. At the maximum there was only 200,000 hp., and the power would be demanded elsewhere, probably at Cedars Rapids or along the St. Lawrence.

Replying to a question in the House of Commons, the Minister of Trade and Commerce said the other day that more than two billion kilowatt-hours of electric power has been exported from Canada within the last five years.

New Chain of Companies for Rocky Mountain Region

Another chain of small light and power companies has been organized in the Rocky Mountain region. Its formation has just been announced by E. P. Bacon, who was vice-president and general manager of the Natrona Power Company at Casper, Wyo., until the recent absorption of that company by the H. M. Byllesby interests. The new company is known as the Midwest Public Service Company and has been chartered to operate in Wyoming, South Dakota and elsewhere. H. C. Chappell, formerly Mr. Bacon's assistant with the Natrona company, is associated with him in the new arrangement as general manager of the company. It is understood that Salt Lake City capital is behind the new organization which has already assumed control of the Big Horn Utilities Company of Greybull, Wyo.; the Western Utilities Company of Edgemont, S. D., and the Platte Valley Power Company of Valley, Neb. Operating headquarters will be maintained at Casper, although plans of the company contemplate extension of activities to every state in the mountain region and also to western Kansas and Nebraska.

Plans 700,000-Kw. Generating Plant

Ultimate Rating Selected for New York Edison Company's East River Station Is the Highest Yet Adopted—Initial Installation 120,000 Kw.—Mercury Turbines in View

THE general design of the great generating station which, as announced some months ago, is to be erected by the New York Edison Company at Fourteenth Street and the East River, and which will be known as the East River station, has recently been announced by Thomas E. Murray, Inc., the designing engineers. The station is laid out for an initial installation of 120,000 kw. and for an ultimate capacity of 700,000 kw., a rating higher than that of any other station now built or designed. It is being built to take care of an average annual growth of 10 per cent in the company's load. Buildings to house the initial installation will cover an area of about 355 ft. x 206 ft., and the total plant will cover an area about 1,092 ft. x 206 ft.

The prime movers in the initial installation will be two 60,000-kw., 25-cycle, 11,400-volt General Electric turbo-generators. In addition a 40,000-kw., 25-cycle, 11,400-volt-60-cycle, 13,800-volt General Electric frequency changer will be installed in the turbine room. Ten 1,550-hp. Springfield water-tube boilers equipped to use pulverized fuel are to furnish steam for the first turbine installation. They will be operated to give 375 lb. pressure and 700 deg. total temperature at the throttle.

The electric galleries containing the switching equipment will extend along the north side of the main building with the control room, office and service department in the section of the building closest to the East River. All main auxiliaries will be steam-driven.

In future installations some of the boilers and turbines may be of the mercury type. The exact size and rating of these have not been definitely decided. Seven more steam turbines, each of 60,000 kw. or larger, are contemplated. It is probable also that another 40,000-kw. frequency changer will be installed when a demand for greater interchange of power with the 60-cycle system occurs.

The new station will be interconnected with the 25-cycle system of the Edison-United companies by underground transmission lines of 11,400 volts. The Sherman Creek station has at present 40,000 kw. in 25-cycle generating equipment and the Hell Gate station 105,000 kw. The Waterside stations have 347,200 kw. capacity and smaller stations 53,600 kw., making a total of 545,800 kw. in 25-cycle generators available.

The voltage of the 60-cycle side of the frequency changer will be 13,800 volts, and this voltage will be raised to 27,600 volts by transformers to connect by means of underground transmission lines with the Edison-United 60-cycle systems, the Brooklyn Edison and other outside systems.

The turbo-generators, boilers, frequency changer, switching equipment and some of the auxiliaries have already been contracted for.

Miami Company Keeps Pace with City's Growth

In order to keep up with, or even ahead of, the rapid growth of Miami, Fla., the Florida Power & Light Company has just installed a 12,500-kw. turbo-generator as the first unit in the new steam plant which is approaching completion on the site of the old power house on the Miami River. This unit cost $300,000 and its erection completes part of the four-million-dollar program planned this year for the local com-

pany, the Miami Electric Light & Power. One million dollars was spent last year before the company was taken over by the larger organization, which is itself a subsidiary of the American Power & Light Company. Two and one-half millions represents the total expenditure to be made on the generating station, the balance representing the cost of three new substations at $75,000 each, of placing cables underground and of adding 50 miles of wire to the distribution system. A second turbo-generator of the same rating as the one referred to above is to be installed.

The new plant will have a total capacity of 46,625 kw., or more than four times that of the old plant. This, it is estimated, will take care of the demand of twice Miami's present population of 36,000—an increase confidently looked for by the power-plant officials and citizens generally.

News and Gossip from the Capital

President's Investigation of Muscle Shoals—Some Doubt Whether Lease of Properties Will Be Effected—International Water Power—South American Opportunities

(By Our Washington Correspondent)

AN INVESTIGATION to determine the respective advantages and disadvantages of leasing the power soon to become available at Muscle Shoals, pending action by Congress, is being made at the instance of the President. The following question recently was submitted to White House officials: "In view of the dry season and the urgent need for power in the South, would it be the policy of the administration to withhold Muscle Shoals power from use and forego the $2,000,000 in revenue which would accrue to the Treasury from that source?" In reply it was stated that the President is anxious to handle the Muscle Shoals properties of the government in such a way as to insure the greatest public service and so as to make possible the maximum return to the Treasury. He does not want to make any disposition of power which would hamper the final settlement. He is considering whether or not a temporary lease would hamper settlement to the extent that it would amount to a loss in the long run.

As this is written the Muscle Shoals Commission has still made no reply to the letter of the Secretary of War as to the temporary disposition of the power. It is believed that certain members of the commission are prepared to take the position that no use whatever should be made of the power pending final action by Congress. Some think a majority of the commission will favor the testing of the new equipment with water rheostats rather than under load. A majority of the commission has been influenced to take that position, it is said, by the belief that once Muscle Shoals power is made available to the public there would be no way of calling it back. The combination in Congress of representatives of the consumers of this power with those interested in public ownership and with members who are friendly to power or fertilizer industries could not be overcome, it is declared.

THE NEW BRUNSWICK PROJECT

The Department of State should interest itself formally in the questions involved in the proposed development of a power project at Great Falls in the St. John River by the Province of New Brunswick. Opinions to the foregoing effect are reaching Washington from persons thoroughly conversant with the project. At present the State of Maine is the only state concerning itself with American equities in this development.

The Province of New Brunswick is planning a hydro-electric commission along the line of that in Ontario. While the site which it is proposed to develop is not in the international section of the St. John River, it is at a point only a few miles distant from the point where the stream leaves the international boundary and the improvement will raise the water level in the international section. It is maintained that conditions should be laid down in advance which will insure return to the United States of its share of the power without the payment of export duties.

LATIN-AMERICAN PLANTS

No better opportunity ever was offered than at present for American public utility concerns to take over such enterprises in nearby Latin America, in the opinion of a federal specialist who just has returned from a trip through the countries bordering on the Caribbean. The point has been reached in several cities where the electrical utilities must be expanded and re-equipped. There is frequently no disposition on the part of the local owners to undertake the financing that will be necessary. In practically every case experienced management could make large savings in operating expenses. The field is declared to be one of inviting possibilities.

Pacific Coast Jobbers Meet and Discuss Credits

The subject of credits was the chief topic of papers and discussion at the regular quarterly meeting of the Pacific Division of the Electrical Supply Jobbers' Association, held at the Arlington Hotel, Santa Barbara, Cal., May 7 to 9. Discussion indicated that electrical jobbers are coming to recognize more and more the importance of the credit department in their business and the necessity of assisting the contractor-dealer in his accounting problem. Frederic P. Vose of Chicago, secretary of the National Electric Credit Association, explained the Milwaukee plan, which is being used in some cities of the East. This, he said, is a plan to encourage the contractor-dealer to install a proper accounting system in his business. The next jobbers' meeting will be held in the Pacific Northwest in the summer.

Beck on St. Lawrence Plan

Sir Adam Assails Financial Scheme of Canadian Association as Unfair to Ontario

THE proposal that Ontario power users bear the whole cost of the St. Lawrence development is objected to in a pamphlet put forth by Sir Adam Beck, chairman of the Ontario Hydro-Electric Power Commission. The pamphlet is a reply to one issued last year by O. E. Fleming, president of the Canadian Deep Waterways and Power Association, in which he advocated the development of the St. Lawrence route as an international work by the governments of the United States and Canada, but urged that part of the power developed on the Canadian section should be sold to the Hydro-Electric Power Commission at cost for distribution in Ontario. The association also advocated the development of water power and the construction of the undertaking under the supervision of the Ontario Hydro-Electric Power Commission and the government of Canada, so far as concerns Canada's side of the question.

Sir Adam Beck's pamphlet is ponderously entitled "Unjust and Harmful Proposals Published by an Authority Known as the Canadian Deep Waterways and Power Association, Under the Chairmanship of O. E. Fleming, Examined and Exposed." In it he declares that under Mr. Fleming's plan the Province of Ontario would have to pay not only its own share of the St. Lawrence scheme, which would be $57,500,000, but the entire cost of the navigation scheme, or another $137,000,000. "Thus the shippers," he says, "including the Western farmers of the United States and Canada, are to get their canal system free of charges; New York State is to get a power development of equal size at less than one-third the cost to Ontario; Quebec is to bear no portion of the cost of improving navigation, even within its own borders, although its share of the power development will eventually be greater than that of Ontario; and all this because, according to Mr. Fleming, the people of Ontario can well afford to pay."

The gist of Mr. Fleming's plan is that the financing of both the navigation and power ends of the projects, backed by the Dominion and United States government, would effect savings of $175,000,000 over what the cost of power development alone would be if Ontario proceeded with the plan of power development of which Sir Adam is an advocate and Quebec and New York made similar developments independently. Sir Adam avers that the estimated savings are five times too high and consequently would not pay for the navigation side of the scheme.

Major A. C. Lewis, secretary of the Canadian Deep Waterways and Power Association, when confronted with Sir Adam Beck's statement, said the estimates of the cost of the St. Lawrence scheme which had been scored by Sir Adam were not those of the association, but were estimates made by Mr. Fleming at the request of C. A. Magrath of the Canadian section of the International Joint Commission.

Southern Men Discuss Means to Forestall Drought

Operating officials of the leading electric power companies of the Southeast held a conference in Raleigh, N. C., on May 9 for the purpose of discussing detailed plans for closer interconnections and a pooling of power resources during the approaching summertime months. The representatives present were a sub-committee of power company executives. The discussions are said to have been devoted largely to a survey of the power situation in the Southeastern States and to means by which a shortage, if one should arise in any locality through extreme low water in the streams or from any other causes, might be met by a supply of energy from neighboring companies. There were present at the conference officials from the largest power companies of Alabama, Georgia, Tennessee and North and South Carolina.

With reference to the purposes of the conference it was said that on occasions in the past low water in some of the streams of the territory had caused a power shortage, with resultant curtailment of industry dependent on the power companies. There is now, however, a network of interconnecting transmission lines covering the entire section so that power may be transmitted from one section to another as the demands may require.

New Hydro-Electric Projects

The Kentucky Hydro-Electric Company has applied to the Federal Power Commission for a preliminary permit on the North Fork of the Kentucky River near Airdale, Ky. This application is in direct conflict with an application filed by Offut, Longbridge, Gunn & Hitner on October 13, 1924.

The Pacific Gas & Electric Company has applied for a license covering the use of government lands in connection with its Kilare and Cow Creek plants, in Shasta County, Cal.

C. A. Harvey has applied for a license covering a project on Small Creek, a tributary of the Umpqua River in Douglass, Ore.

Rejection of the application of Gay, Otto & Diefendoff for a preliminary permit covering a project on the Middle and North Forks of St. Vrain's Creek and on Cabin Creek in Colorado has been recommended and will be passed upon at the next meeting of the Federal Power Commission.

The Excelsior Water & Power Company has applied for an amendment to its license covering a power and irrigation development on the South Yuba River in California. The company asks an extension of two years.

Water-Power Projects on the Pacific Coast

Rights for a hydro-electric development on the Dosewallips River, near Brinnon, Wash., on Hood's Canal, have been obtained from the State Supervisor of Hydraulics by L. J. Vogter of Tacoma. By the construction of a dam in a narrow canyon, 300 ft. high, a very considerable storage of water can be obtained, with a flow of 500 sec.-ft. Between 20,000 hp. and 30,000 hp. may be developed.

Proposing a million-dollar hydro-electric plant on the Kalama River in Cowlitz County, Wash., Charles T. Wright of Portland, Ore., has filed an application with the State Supervisor of Hydraulics for permission to divert 1,000 sec.-ft., from the river. The electricity to be generated by the proposed plant would be used for lighting, power and railroading.

Construction of a power and irrigation plant in the Similkameen River at Oro ille, Wash., to cost $350,000, will be started in June or July by the Okanogan Light & Power Company of Oroville, recently organized. E. J. Broderick, engineer for the company, says that the development involves the erection of a masonry dam 60 ft. high. It is planned to develop about 20,000 hp.

Adirondack Power & Light Has Plans for Farm Service

Plans to supply electrical energy to two thousand rural customers in New York State in the territory between Oneida on the west, Lake George and Hudson Falls on the north and Schenectady are reported to be under consideration by the Adirondack Power & Light Corporation. The total cost of the work is estimated to exceed $200,000.

The development, according to the published report, calls for 143 miles of lines, 25 miles of which are already completed and in operation and 58 miles of which are under construction. This leaves 68 miles to be constructed. The territory is divided into thirteen districts and the rural extensions will radiate from central points. The plan of development under which these lines are being constructed calls for erection of the lines by the company, the initial financing cost to be borne by it.

Disaster Overtakes Engineering Party on Mississippi

News of the sudden and unexplained sinking of the Mississippi River boat *Norman* about 12 miles south of Memphis on May 8 carries with it the announcement that twelve members of an inspection party from the first annual convention of Mid-South engineers at the city named lost their lives, as well as five women of their party, a boy and four members of the crew. The male passengers who lost their lives were civil engineers, some of them of prominence in the profession. They include Paul H. Norcross, consulting engineer, Atlanta; William M. Gardner, United States assistant engineer, Memphis; Walter G. Kirkpatrick, professor of municipal engineering, University of Mississippi, and Robert H. McNeilly, professor of civil engineering, Vanderbilt University, Nashville, Tenn.

More than a hundred engineers and their friends had embarked on the doomed boat. Prof. J. Dorroh of the University of Mississippi; Captain C. H. West, a member of the Mississippi River Commission, and W. W. DeBerard of Chicago, Western editor of the *Engineering News-Record*, were among the saved.

Middle West Rural Service

Agricultural Colleges in Illinois and Ohio Are Co-operating with Other Agencies

ELECTRIC power is being used on three of the ten farms designated for investigation and tests of electricity in agricultural activities, according to the College of Agriculture of the University of Illinois. The electric power interests of the state have established a community 8 miles southwest of Urbana for the experiment. Small units are being used as a source of power.

E. W. Lehmann, head of the farm mechanics department of the college says: "These ten farms are perhaps as representative as any that could be found, and the restricted use of electric power on them is in itself an indication of the need of more facts on the place that electricity can take in agriculture. The investigation is intended to throw light on the costs of building and maintaining rural power lines, the adaptability of electric power to different farm operations, the amount used in these operations, possible new uses of electricity on the farm, possibility of the farmer using electrical energy when the city industrial load is light and also the merits of the small-unit electric plant. The use of electricity as a source of power for the major chores on the ten farms is at present almost negligible. Tractors, stationary gas engines, steam engines and horses are relied upon for the power needed."

The Illinois State Electric Association and the Illinois Public Service Company are co-operating with the college in the investigation, which is conducted as a regular research project by the farm mechanics department. The study will probably cover a period of three years.

Study Begins in Ohio

This month will see the beginning of a study of the application of electricity on the farms of Ohio sponsored by the National Electric Light Association in co-operation with the College of Agriculture of the Ohio State University at Columbus, farm organizations and manufacturers. The investigational work will be conducted from headquarters in the department of agricultural engineering at the College of Agriculture. B. P. Hess, county agent in Brown County, will undertake the work.

The Ohio Committee on the Relation of Electricity to Agriculture, under whose immediate auspices the work will be done, is composed of Dean Alfred Vivian of the College of Agriculture, Dean E. A. Hitchcock of the College of Engineering and Prof. Glenn W. McCuen of the department of agricultural engineering, representing the Ohio State University; L. B. Palmer and Murray D. Lincoln, representing the Ohio Farm Bureau Federation; W. H. Prior, G. E. Reiff and N. Olmstead, representing the manufacturers, and J. B. Johnson, E. T. Wagenalls and O. H. Hutchins, representing the utilities. Dean Vivian is chairman of the executive committee, and P. B. Potter of the department of agricultural engineering at the university is secretary-treasurer.

Northeastern A. I. E. E. Has Good Meeting

Educational and Technical Developments Provide the Subjects for Excellent Papers and Discussions at Swampscott (Mass.) Regional Convention of Institute

PROGRESS in technical education and in engineering provided the subject matter for an attractive and diversified program at the second regional convention of the Northeastern District of the American Institute of Electrical Engineers at Swampscott, Mass., May 7-9. Vice-president H. B. Smith was general chairman, and the total registration was 360. At the opening session Thursday President Farley Osgood emphasized the growing importance of personnel problems in engineering and the broadening relations of the profession to the public service.

COMBATING SLEET AND ICE

C. R. Oliver, assistant general manager New England Power Company, Worcester, presented the following conclusions in a comprehensive paper on "Sleet and Ice on Transmission Lines": (1) Transmission towers should be designed to stand regardless of the load on the conductor; (2) earth footings often fail in compression and guys are of little value; (3) guys at angle points are a poor makeshift and heavier towers are far better; (4) A-frame towers are a poor reliance under sleet conditions, even if reinforced every half mile by square towers; (5) vertical spacing of conductors is unsatisfactory; (6) the so-called "standard" 75-ft. steel tower will not carry a sleet load satisfactorily; (7) wooden-pole lines suffer less damage than most steel lines and can be restored more quickly to service, usually in a day or two; (8) only absolutely necessary angles in lines should be allowed, and (9) all lines should be designed as carefully as other engineering structures. The paper described the company's scheduled method of short-circuiting lines temporarily withdrawn from service and controlling sleet formation by melting.

An extended discussion of Mr. Oliver's paper by representatives of operating companies voiced general recognition of the growing importance of better structural design for high-voltage lines. Sleet prevention by increased electrical circuit loading is succeeding on the Pennsylvania Power & Light Company's system, and provision for sleet prevention is being made on the Montaup Electric Company system in Massachusetts. President Osgood touched upon the increased flexibility of wooden-pole lines in meeting sleet strains and said that the use of one pole per phase wire will soon be tried on his system in New Jersey, with careful attention to guying and the installation of insulator strings to carry the wire out of a tangent path on turns. A so-called "derrick type" of pole will be employed. Tests on Moloney-type steel-tower footings showed entire rigidity even when pulled by a 200-ton crane. R. E. Argersinger, Stone & Webster, Inc., criticised "handbook methods" of steel-tower design and urged more thorough study of stresses. W. J. Dawson, Lynn, Mass., cited the neglect of compression members of towers by many designers.

"Overvoltages on Transmission Lines Due to Dropping of Load" were discussed in a paper by E. J. Burnham, General Electric Company, and in comments following this the importance of obtaining rapid hydraulic governor action without excessive penstock strains was brought out. A three-second interval of speed increase was thought excessive by several speakers. J. A. Johnson, Niagara Falls, N. Y., cited the successful application of the primary relay of a standard induction regulator upon 30 per cent overvoltage and within 10 cycles. The use of penstock bypasses abroad and relief valves in America was also mentioned as an aid to quick governing.

C. A. Nickle, General Electric Company, read a paper upon "An Electromechanical Problem Analyzer," and J. E. Jackson, Alabama Power Company, and O. E. Charlton, General Electric Company, presented a paper on "Iron Losses Under Superimposed Alternating-Current and Direct-Current Excitation," both investigations involving the use of oscillographic methods.

TRANSFORMER VOLTAGE

Transformer voltage and ratio control was discussed from various angles in the afternoon session in papers by H. C. Albrecht, Philadelphia Electric Company, and L. F. Blume and M. H. Bates of the General Electric Company. The increasing importance of tap changing in relation to interconnection was emphasized. B. G. Jamieson, Chicago, said that steps of about 2.5 per cent give reasonable smoothness in transition. He strongly favored accessible tap-changing facilities, putting these outside the transformer case as far as possible. H. W. Smith, Westinghouse company, cited the use of autotransformers in tap changing and the value of the step induction regulator for such service. Open-delta operation, switching of taps and replacement of all legs in seriatim with transformer units in banks had been found convenient in de-energizing a dead Edison system. A. H. Kehoe, United Electric Light & Power Company, New York, demanded facilities permitting regular inspection of ratio-adjusting apparatus.

L. C. Packer, Westinghouse company, then presented a paper on "Universal Type Motors," followed by R. W. Wieseman on a "Two-Speed, Salient-Pole Synchronous Motor" and R. F. Franklin on "Short-Circuit Currents of Synchronous Machines," both authors being from the General Electric Company. A discussion followed of the potential dangers of grounded 110-volt circuits from the standpoint of physical shocks.

Commenting upon Mr. Wieseman's paper, F. L. Fairbanks, Boston, pointed out the need of a starting torque of at least 50 per cent in heavy compressor motors for the Quincy Market Cold Storage Company and emphasized the necessity of motor designs permitting convenient speed changes many times a day.

Cables, joints and insulation were considered at the Friday morning session, discussion concentrating upon the paper of E. W. Davis and G. J. Crowdes, Simplex Wire & Cable Company, Boston, on "Cable Joints." A résumé of this discussion will appear in a later issue. A paper presenting extensive data upon "The Effect of Repeated Voltage Application on Fibrous Insulation," by F. M. Clark, General Electric Company, attracted much favorable comment, as did another by E. D. Eby of the same company on "Oil-Filled Terminals for High-Voltage Cables."

EDUCATIONAL PROGRESS

Prof. W. H. Timbie described the co-operative course in electrical engineering at the Massachusetts Institute of Technology, and S. W. Ashe, General Electric Company, presented a paper on "Education in Industry." Prof. H. B. Smith outlined the co-operative course in use at the Worcester Polytechnic Institute, and Prof. W. L. Smith touched upon the Northeastern University co-operative course. All the speakers testified as to the benefits of these courses to students, industry and the educational institutions.

J. C. Clendenning, General Electric Company, Lynn, commended this work, and several students spoke enthusiastically of the training. Prof. C. A. Adams of the Harvard Engineering School made a powerful plea for the study of fundamentals. E. W. Davis deplored the lack of collegiate teaching in the field of dielectrics, and D. A. Dooley of the Massachusetts department of university extension told of its work, which is now about to be extended to serve the entire country. E. S. Mansfield testified as to the benefit of educational work among Boston Edison employees.

Problems in meters and measurements occupied the entire session Saturday morning. A notable contribution to the art of precision measurement was reviewed by K. B. McEachron and E. J. Wade of the General Electric Company in a paper on "Studies of Time Lag of Needle Gaps." Oscillograms were shown of wave phenomena occupying 0.5 microsecond.

E. S. Lee, General Electric Company, read a paper showing that with properly organized test staffs little advantage in accuracy can be gained by the use of automatic methods of instrumental reading. Progress in reducing temperature errors in induction watthour meters was covered by I. F. Kinnard and H. T. Faus, General Electric Company, and S. H. Hoare of the same company told of improvements in indicating instruments. J. A. Stratton and J. K. Clapp of the Massachusetts Institute of Technology described a method of calibrating wave meters by making the harmonics of a distorted wave generator audible by beating with a heterodyne oscillator. The method checked within 0.2 per cent in determining the lengths of standing waves on parallel wires. In the discussion, F. G. Magalhaes, New York, and C. H. Ingalls, Boston, outlined field problems.

Ready for Annual Meeting

A. I. E. E. Adopts a Tentative List of Technical Papers for Saratoga Convention in June

A TECHNICAL program which, although limited in volume, will cover many especially interesting topics and the customary abundant summer sports make up the schedule of events, now virtually complete, for the annual meeting of the American Institute of Electrical Engineers, to be held at the United States Hotel, Saratoga Springs, N. Y., on June 22 to June 26. The afternoons will be free for enjoyment, and the mornings will be devoted to the technical proceedings.

On the second and third morning the committee reports and reviews will be in order; on Thursday and Friday mornings, June 24 and 25, carefully chosen papers will be presented and discussed, and at an evening meeting—probably on Thursday—two noteworthy discourses on hydro-electric development will be delivered. These are "Power Possibilities at Muscle Shoals," by S. S. Wyer, and "The 540,000-Hp. Development at the Ile Maligne, Quebec," by W. S. Lee, chief engineer of the Southern Power Company. The paper last named concerns the Duke-Price plant on the Saguenay River.

At another evening meeting—probably on Wednesday—William E. Wickenden, director of investigations for the Society for the Promotion of Engineering Education, will relate the result of his study of the educational methods of many European countries which he has just visited in the course of his work. Extensive progress in standardization will come in for notice on Tuesday or Wednesday morning. On Monday morning the section meetings will be held.

Following is the tentative list of technical papers to be presented, in addition to the two already named:

"Engineering and Economic Elements of Two-Phase, Five-Wire Distribution," P. H. Chase, Philadelphia Electric Company.

"The Oil-Circuit-Breaker Situation from an Operator's Viewpoint," E. C. Stone, Duquesne Light Company.

"The Quadrant Electrometer," W. B. Kouwenhoven, Johns Hopkins University.

"A New Method and Means for Measuring Dielectric Losses," R. E. Marbury, Westinghouse Electric & Manufacturing Company.

"Separate Leakage Reactance of Transformer Windings," O. G. C. Dahl, Massachusetts Institute of Technology.

"Transformer Harmonics and Their Distribution," O. G. C. Dahl, Massachusetts Institute of Technology.

"Two-Phase-Six-Phase Transformers," A. Boyajian, General Electric Company.

"Resolution of Transformer Reactances Into Primary and Secondary Reactances," A. Boyajian, General Electric Company.

"Losses in Iron Under the Action of Superposed Alternating-Current and Direct-Current Excitations," O. E. Charlton, Alabama Power Company, and J. E. Jackson, General Electric Company.

"Study of Time Lag of the Needle Gap," K. B. McEachron and E. J. Wade, both of General Electric Company.

"Oscillograph Solution of Electromechanical Systems," C. A. Nickle, General Electric Company.

"The Klydonograph and Its Application to Surge Investigations," J. H. Cox and J. W. Legg, both of Westinghouse Electric & Manufacturing Company.

"Overvoltages on Transmission Systems Due to Dropping of Load," E. J. Burnham, General Electric Company.

"The Loaded Submarine Telegraph Cable," O. E. Buckley, Bell Telephone Laboratories.

American Engineering Council Takes Up Water Resources

Resolutions calling for closer cooperation between the federal government and the states in water-development schemes and urging on Congress the need to appropriate at least $500,000 annually to aid the Water Resources Branch of the Federal Geological Survey were adopted at the meeting of the administrative board of the American Engineering Council held on May 8 and 9 at the Engineers' Club, Philadelphia.

A large and enthusiastic dinner meeting was held on the evening of May 8. L. W. Wallace, executive secretary, reported that the council was making steady progress in constructive activity and in influence. Dean Dexter S. Kimball of Cornell, vice-president of the council, appealed for greater unity among engineers in furthering its work. Gardner S. Williams of Ann Arbor, Mich., vice-president, presided over the board's sessions.

A.S.T.M. May Establish Medal and Lecture

The American Society for Testing Materials, which will hold its twenty-eighth annual meeting at Atlantic City, N. J., on June 23-26, will at that time take action upon a recommendation of the executive committee for the establishment, at a cost of about $6,000, to be subscribed by the membership, of a Charles B. Dudley medal and an Edgar Marburg lecture. The medal, to be named for the first president of the society, will, if it is authorized, be awarded to the author or authors of a paper of outstanding merit presented before the society and constituting an original contribution on research in materials, with the understanding that if no paper in any given year seems to merit this distinction, the award will not be made. The lecture, to be named for the society's first secretary, will, if authorized, afford an opportunity for the society to be addressed by leaders in the field of engineering materials who will present outstanding developments in the promotion of knowledge of such materials. It is proposed that in this selection consideration be given to the plan of engaging foreign lecturers at suitable intervals and as the funds permit.

Besides the copious committee reports, many papers dealing with research into the properties of engineering materials will be presented at the coming convention. These papers will include one on "Accelerated Corrosion Tests on Bare Overhead Electrical Conductors," by Frank F. Fowle of Chicago, one on "Evaluation of Corrosion Tests," by E. Blough, and one on "Softening of Hard-Rolled Electrolytic Copper," by N. B. Pilling and George P. Halliwell. Dean Harvey of the Westinghouse Electric & Manufacturing Company, will discuss "The Purchasing of Materials on Specification." Frank M. Farmer, president of the society, chief engineer of the Electrical Testing Laboratories, New York, will present the committee report on electrical insulating materials.

Delegates to International Electrotechnical Convention at The Hague

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IN THE above photograph of the delegates to the meeting of the International Electrotechnical Commission at The Hague, Holland, last month the president, Guido Semenza, representing Italy, is sixth from the left in the front row. Dr. C. O. Mailloux of the United States is immediately on his right and C. Le Maistre, of England, the secretary, is the fourth on his left. American delegates shown in the picture besides Dr. Mailloux are Dr. Clayton H. Sharp, Leonard L. Elden, H. M. Hobart, Charles E. Skinner and E. A. Snyder.

Big Attendance at Houston

Electric Section of Southwestern Public Service Association Discusses Varied Topics

MEETING at Houston, Tex., from Wednesday to Friday of last week for its thirteenth annual convention, the Southwestern Public Service Association, with a total registration of 467, scored a success both in the character of its program and in the arrangements made to entertain and profit the visitors outside of the papers and discussions. A 25-mile boat ride down the Houston Ship Channel to the new Deepwater generating station of the Houston Lighting & Power Company and from there to the San Jacinto battle ground was the main event of this nature.

On Wednesday, May 6, the Commercial Division and the Technical Division of the Electric Service Section of the association both held sessions. In the commercial sessions discussions on load-building topics were led by George S. Jones, Jr., of Dallas and W. R. Cabaness, while W. E. Clement of New Orleans led a discussion on educating employees to be salesmen. Three technical papers were presented—one on power factor and the watt-hour meter by H. O. Crouch of Houston, one on the combined burning of oil, coal and gas by R. H. Forney of Dallas, and one on poles and wire for local distribution lines by J. S. Roth of Corsicana, Tex.

On Thursday the commercial men discussed domestic refrigeration, led by Harry Seaber, and other topics, while the technical men listened to a paper on transformer inspections and tests by E. T. Keck of Dallas, one on economical units for standby plants by E. R. Hoppe of Abilene, Tex., and one on underground distribution by F. G. Frost of New Orleans. On this day the first of the meetings of the Small-Plant Division, referred to last week, was held. The aims of the division were explained by B. F. Cherry, Weatherford, Tex., and the discussions were led by the following: "Training and Holding Employees," Paul Freeman, Navasota, Tex., and W. A. Darter, Giddings, Tex.; "Building and Keeping Good Relations with Customers and City Officials," A. W. Stephan, Yoakum, Tex., and S. Eastland, Kerrville, Tex.; "Rates and Valuations," D. P. Yoder, Snyder, Tex., and M. D. Honaker, Farmersville, Tex. At the second meeting of the Small-Plant Division, held on Friday, a discussion of financing problems was led by Charles F. Ashcroft of Sulphur Springs, Tex., and L. L. Stephenson of San Antonio. R. J. Irvine of Jacksonville, Tex., and F. B. Hall of San Saba, Tex., led a discussion on the importance of a schedule in maintenance work.

Prominent among the addresses before the general meetings of the association were one by James A. Baker, president of the Houston Gas & Fuel Company, on "Some Legal Problems of Public Service Companies"; one by Keith Clevenger, Empire Companies, Bartlesville, Okla., on "Fundamentals of Good-Will Building"; one by S. J. Ballinger, San Antonio Public Service Company, on "Continuing Relations with Customer-Owners," and one by George McQuaid of the Texas Public Service Information Bureau. General Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Company, spoke on "The Future of National Electric Service." His speech, which attracted wide and favorable notice, was abstracted in the ELECTRICAL WORLD last week, page 999.

W. E. Wood, general manager of the Houston Electric Company, was elected president in succession to G. W. Fry of Abilene. Other officers elected were: First vice-president, P. E. Nichols, Galveston; second vice-president, J. C. Kennedy, Marshall, Tex.; third vice-president, W. W. Holden, San Antonio; treasurer, F. J. Gannon, Fort Worth. F. M. Hogue of Dallas, T. H. Williams of Waco, Tex., F. C. Armbruster of Shreveport, La., and B. F. Cherry of Weatherford, Tex., were elected members of the executive committee.

Utilities Publicity Men Gather at Houston

Addressing the fourth annual convention of the Public Utilities Advertising Association, which was held conjointly with the world advertising convention at Houston, Tex., this week, President William H. Hodge of H. M. Byllesby & Company said:

"The Public Utilities Advertising Association exists to promote higher efficiency in utilities advertising. We are doing everything possible to improve copy, obtain greater results for every dollar spent, and to bring more ability and energy to bear on our advertising and publicity problems. It is safe to say that advertising has shortened by one-half the time necessary to reach the present national status of utilities development and that it has saved vastly more in wages not paid to house-to-house canvassers than it has cost. Discard these values accruing to the public and you have left a third value of even greater significance, namely, the services of advertising to enable the public and the utilities to understand each other and come to agreements for utility development."

Martin J. Insull, president Middle West Utilities Company, addressed the convention on "The Benefits of Public Utility Advertising to the Consumer."

Secretary of Commerce Hoover in addressing the main body, the Associated Advertising Clubs of the World, said: "One profound economic effect of advertising is ofttimes overlooked—its influence upon production. The general knowledge and rapid distribution of an article, which can only be accomplished through advertising, creates large production and thus lower costs and prices. Modern advertising is the handmaiden of mass production."

Opposing the tendency to look to the government for the solution of every difficulty in the body politic, Mr. Hoover observed: "Such associations as yours, in the erection of ideals of a profession, in the determination of methods and definitions of standards for the elimination of abuse, exemplify self-government, and self-government in the greatest form of which democracy has yet given conception—that is self-government outside of government."

Utility Men Meet at Joplin

Junkersfeld, Owens and Others Talk at Successful Convention of the Missouri Association

ONE of the most successful conventions ever held by the Missouri Association of Public Utilities met at Joplin on May 7, 8 and 9. The attendance was approximately 300 and both papers and entertainment were of a high order. The announcement at the opening session Thursday morning of the death of Milan R. Bump brought an adjournment till afternoon out of respect to his memory. Mr. Bump started his public utility career at Joplin and had expected to attend this convention. His sudden death caused many of the Empire District Electric Companies' executives (including C. L. Proctor, president of the association) to be absent from the convention. Wiley F. Corl of St. Louis, first vice-president, presided.

J. F. Owens, general manager of the Oklahoma Gas & Electric Company, discussed public relations in a vigorous way, and his address was followed by an animated discussion from the floor.

"There are three main points in promoting public relations," said Mr. Owens. "First is the selection of persons, and too much stress cannot be laid upon this point. Then there is the contact of this personnel with the public. Every member of a public utility should be thoroughly informed." The third point was newspaper advertising.

Louis Friedman of the General Electric Company, Chicago, spoke on "Street and Highway Lighting." He brought out clearly the fact that street lighting has not kept pace with the growth of the American city, and touched upon highway lighting and its connection with rural service.

"Recent Engineering Developments" was the subject of an illustrated paper presented by Col. Peter Junkersfeld of McClellan & Junkersfeld, New York. Colonel Junkersfeld said: "Only a few years ago an average consumption of 37,000 B.t.u. per kilowatt-hour generated was a good figure for our larger electric light and power stations. Today 19,000 B.t.u. is a representative average, while a few stations produce a kilowatt-hour from 16,000 B.t.u."

Miss Helen Steiner, advertising manager of the Ohio Public Service Company of Lorain, talked entertainingly upon "Feminine Power Factor," saying that utility companies should be properly "womaned" as well as properly manned.

A trip to the mines at Picher, Okla., and a visit en route to the Riverton plant of the Empire District Electric Company were outside diversions on Friday afternoon. In the evening the annual banquet and dance were held.

The association elected Wiley F. Corl, president of the Community Power & Light Corporation of St. Louis, as its next president. Other officers elected were F. S. Dewey, vice-president Kansas City Power & Light Company, as first vice-president; W. H. Henby, manager West St. Louis Water & Light Company, as second vice-president, and O. W. Mathson, manager Missouri Power & Light Corporation, Mexico, as third vice-president.

Briefer News

Michigan Electric Light Association to Convene in June.—The annual convention of the Michigan Electric Light Association, held in combination with the Michigan Gas Association, will meet at the Grand Hotel, Mackinac Island, on June 25-27. Technical problems, advertising, public relations and service standards will be discussed.

Montreal Electrical Club Elects Officers.—At the closing luncheon for the season 1924-25 of the Electrical Club of Montreal, E. S. M. Macnab was chosen president for the coming year, Lee H. Jones vice-president and T. H. Chennell secretary-treasurer. A committee of ten to direct the affairs of the association was chosen.

Electric Club of Chicago Indorses Deep Waterway.—At a meeting held on May 5 the Electric Club of Chicago passed a resolution indorsing the St. Lawrence and Lakes-to-Gulf deep waterway projects, basing its indorsement on the electrical development involved and on the great economies in transportation that would accrue to electrical and other manufacturers.

Boston Edison to Build Line from Weymouth to Bellingham. — As noted under "Business Conditions" last week, the Edison Electric Illuminating Company of Boston intends to construct a 31-mile line from its new plant at Weymouth to Bellingham, Mass., on the Rhode Island border. This will be a two-circuit, steel-tower line, operated at 110,000 volts, and will cost $1,740,000.

Iowa Electric Company Buys Dam Site on Maquoketa River.—The Iowa Electric Company of Cedar Rapids has purchased a dam site at Canton, on the South Fork of the Maquoketa River, 14 miles southwest of Cascade, where in former years a mill was operated by water power. The site is one of the finest in the state. The new dam, which will have a 12-ft. fall, will not be constructed until 1926, though the company has begun to drill.

Offers Made for Dothan Municipal Plant.—John R. Keyton, a business man of Dothan, Ala., has offered to pay the city $1,250,000 for the local light and water plants and a thirty-year franchise. Several weeks ago the Gulf Electric Company, a subsidiary of the Alabama Power Company, offered $820,000 for the two plants. The offer was rejected. Whom Mr. Keyton represents, if any one besides himself, has not been made public.

Contest Over Wynooche River Development Continues.—That the Grays Harbor Railway & Light Company of Aberdeen, Wash., will develop hydro-electric projects in the Olympic peninsula even if the city of Aberdeen decides to develop a similar project on the Wynooche River is the statement made by E. N. Sanderson, president of the Federal Light & Power Company of New York, of which the Grays Harbor Company is a subsidiary, on a recent visit to Aberdeen. The city of Aberdeen has retained Carl F. Uhden, engineer in charge of the Skagit River power plant for the city of Seattle, to make a survey of the Wynooche hydro-electric project supplementary to the report made by Water Superintendent S. C. Watkins.

Chickasha's New Hydro Plant Withstands Flood.—The new hydro-electric generating station of the Chickasha (Okla.) Gas & Electric Company, situated about 4 miles below that city on the Washita River, was shut down for a few days recently on account of high water. It was not damaged, however, and F. D. Shaffer, manager of the company, says he is confident that it will withstand any floods that are likely to be encountered. Water ran four feet deep over the spillway of the dam at the new plant, but was under control at all times.

Illuminated Tourists' Signs at Roanoke, Va.—The Lions' Club of Roanoke, Va., has recently installed a number of illuminated tourists' signs on the poles of the Roanoke Railway & Electric Company. Each sign is illuminated

with a 100-cp., 7½-amp. gas-filled tungsten lamp connected in the regular series street-lighting circuit and controlled from the power station. A series street-lighting transformer is employed to reduce the voltage. The city pays for the operation of the signs under the existing street-lighting contract with the company. These signs show up well in the daytime and are distinctly legible for a considerable distance at night. The Lions' Club financed the cost of the signs, the idea originating with one of the club members, Roy F. Dowdy, contract agent of the Roanoke Railway & Electric Company, who designed the sign.

Catskill Power Corporation Seeks to Acquire Nyack and Orange County Plants in New York State.—Application has been made to the New York Public Service Commission by the Catskill Power Corporation, newly organized, for permission to take over certain hydro-electric plants belonging to the Rockland Light & Power Company of Nyack and the Orange County Public Service Corporation. The Catskill corporation says it desires to develop the Mongaup River and its tributaries. The companies are owned by the same interests.

Penn Public System Has New Office Building in Erie.—A headquarters office building for the northwest region of the Penn Public Service Corporation has just been completed in Erie, Pa., on West Tenth Street. The new building has a frontage of 40 ft., contains four stories and basement and is in the Italian Renaissance style, presenting an attractive architectural appearance. The main office is designed and lighted in the most modern style. On the fourth floor is a recreational center for employees equipped with an electric kitchen and a dance hall and meeting room.

Wisconsin Legislature Has Bill to Permit County Ownership of Utilities.—A bill has been introduced into the Wisconsin Legislature which would allow counties to own and operate public utility properties, issuing mortgage bonds against them to provide the cost. Supporters of the bill say that it is designed to bring relief from rates charged by interstate companies which favor other states at the expense of Wisconsin. These advocates say that the Northern States Power Company, for instance, sells its output to Minnesota consumers at a rate considerably lower than that charged Wisconsin consumers in spite of the fact that the latter are nearer the production source.

Houston-Rosenberg Line Completed.—The Houston Lighting & Power Company has finished the construction of its high-voltage transmission line from its new plant at Deepwater, near Houston, to Rosenberg, Tex., 37 miles distant. Other similar lines will be built by the company around Houston, according to H. O. Clarke, assistant general manager. The new line will furnish electrical power to Sugar Land, Missouri City, Stafford, Blue Ridge and Pierce Junction, serving about five thousand people from the start. With the installation of the Rosenberg line the Houston Lighting & Power Company took over the Rosenberg and Richmond power plants.

Pacific Coast to Have Electric Truck School.—Central-station employees and others interested will have an opportunity to attend an electric truck school in San Francisco June 9 to 13 inclusive, under the auspices of the Pacific Coast Electrical Association, just prior to the N. E. L. A. convention. Six nationally prominent electric truck men who are coming to the Coast to attend the national convention have already agreed to serve as instructors. Lectures will be given only in the afternoons, the mornings being given over to inspection of equipment displays and truck fleets. This arrangement will permit attendance also at the lectures of the industrial heating school which will be given during the same week. Both schools will meet in the new Pacific Gas & Electric Building.

High-Tension Line from Gary to Michigan City Soon to Be Built.—Erection of a 132,000-volt steel-tower transmisson line from the power station at Aetna, near Gary, to Michigan City, Ind., will begin in July. There will be 125 towers ranging in height from 90 ft. to 115 ft. The longest span between towers will be 1,000 ft. The line will be owned by the Calumet Power Company, of which Samuel Insull is president, but will be operated by the Northern Indiana Gas & Electric Company, which owns the distribution system in Michigan City. The line will cost approximately $1,500,000 and will be built on a private right-of-way 150 ft. in width for the entire distance. It will be 24 miles in length and will parallel the South Shore railroad lines

for 16 miles of the distance. A 15,000-kw. substation will be built on the lake front in Michigan City west of the harbor, and a 33,000-volt line will be built between this substation and the substation of the South Shore lines now operated by the Northern Indiana Gas & Electric Company. The line will be tied in with the Illinois lines of the Insull system.

Power Resources of Roaring Fork of Colorado River.—Seven undeveloped power sites on the Roaring Fork of the Colorado River, in Colorado, between Snowmass and the mouth of the river, say government engineers connected with the Geological Survey, could be made to furnish 31,500 hp. for 90 per cent of the time and 54,000 hp. for 50 per cent of the time. Five additional sites in the river basin have been developed and the combined capacity of the turbines amounts to 6,540 hp., but on account of the closing down of some of the silver mines in the vicinity only 3,850 hp. is being used. At one of these sites a canal 5 miles long would permit the development of 10,000 hp. for 50 per cent of the time and 6,000 hp. for 90 per cent of the time.

National Electrical Credit Association Meets in June.—Opening at Atlantic City on Saturday, June 6, and adjourning to Philadelphia on the following Monday, the National Electrical Credit Association will carry out a carefully prepared program of reports and addresses, with abundant entertainment in between. Committee reports and an address by Theodore W. Schimpf, president Seaside Trust Company, on "Banks, Bankers and Credit Men," will fill Saturday afternoon. Among the addresses in Philadelphia will be one on "How to Place and Control Credit Limits" by A. F. Hearl, secretary-treasurer American Electrical Supply Company, Chicago, and one on "Friendly Adjustments" by Charles A. Kane, Boston, secretary New England Electrical Credit Association. Dr. Edward J. Cattell of the Philadelphia Chamber of Commerce and Charles C. Parlin of the Curtis Publishing Company, Philadelphia, are among the outside speakers expected.

Senate Committee to Hear Testimony on Boulder Canyon at Los Angeles Next Fall.—The United States Senate commission on irrigation and reclamation plans to assemble in Los Angeles on October 26 to take testimony in connection with the proposed development at Boulder Canyon on the Colorado River. Following that hearing the committee will proceed to Boulder Canyon to make a personal inspection of the site. It will make a trip up the river as far as Glenn Canyon. Hearings also will be held in Las Vegas, N. M., and Yuma, Ariz.

Investigate Water-Power Site Near Richmond, Ind. — A hydro-electric power plant at Abingdon, Ind., 10 miles south of Richmond, on the Whitewater River, is under consideration. John A. Shaffer, engineer for the Hoosier Hydro-Electric Company of Indianapolis, has inspected the site, where there is a fall of 278 ft. in a short distance. The banks of the Whitewater are precipitous, and the low land between them would, it is said, preclude the necessity of overflowing a large acreage.

Mexico and United States to Discuss Colorado and Rio Grande Rivers.—The International Streams Commission, of the American section of which Commissioner of Reclamation Mead is chairman, is to be enlarged. Its present members, in addition to Dr. Mead, are General Lansing H. Beach, formerly chief of engineers, and W. E. Anderson of Texas. Two new members will probably be added. The commission's study is to cover the Rio Grande and Colorado Rivers. Mexico has asked that ten months be allowed for the members of its section of the commission to familiarize themselves with the situation and with the work done by the Diaz commission prior to 1910. The Rio Grande commission, of which Secretary Hoover is chairman, is to deal with the river above El Paso. The problem is to determine the respective shares of water to which Texas, New Mexico and Colorado are entitled. Hearings will not be held until fall.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, January 3, page 76.]

American Society of Mechanical Engineers—Milwaukee, May 18-21. C. E. Davies, 29 West 39th St., New York.

Southeastern Water and Light Association—Hotel Patten, Chattanooga, Tenn., May 19-21. W. F. Steiglitz, Columbia, S. C.

Electrical Manufacturers' Club—Hot Springs, Va., May 19-22. S. B. Belden, Jeffrey Manufacturing Co., Columbus, Ohio.

Middle West Division, N. E. L. A.—Hotel Fontenelle, Omaha, Neb., May 20-22. (Conjointly with Nebraska Section.) H. M. Davis, Fraternity Building, Lincoln, Neb.

Georgia Electrical Association—Atlanta, May 21-22. W. W. Barr, Georgia Railway & Power Co., Atlanta.

Electric Power Club—Hot Springs, Va., May 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland, Ohio.

American Association of Engineers—Orlando, Fla., June 2-5. C. E. Drayer, 63 East Adams Street, Chicago.

Electrical Supply Jobbers' Association—Hot Springs, Va., June 3-5 Franklin Overbagh, 411 S. Clinton St., Chicago.

Iowa Section, N. E. L. A.—Waterloo, Iowa, June 3-4. H. E. Weeks, 623 Union-Davenport Bldg., Davenport.

National Electrical Credit Association—Atlantic City, June 6-7; Philadelphia, June 8-9. F. P. Vose. Marquette Bldg., Chicago, Ill.

Associated Manufacturers of Electrical Supplies — The Homestead, Hot Springs, Va., June 8-12. F. Nicholas, 30 East 42d St., New York.

Northwest Electric Light and Power Association (Geographic Division N. E. L. A.)—Gasco Bldg., Portland, Ore., June 12. W. A. White, Puget Sound Power & Light Co., Portland.

Pacific Coast Electrical Association (Geographic Division N. E. L. A.)—San Francisco, June 15. S. H. Taylor, 529 Rialto Bldg., San Francisco.

National Electric Light Association—San Francisco, June 15-19. M. H. Aylesworth, 29 West 39th St., New York.

Society for the Promotion of Engineering Education — Union College, Schenectady, N. Y., June 17-20. F. L. Bishop, University of Pittsburgh, Pittsburgh.

National Council Lighting Fixture Manufacturers and National Association of Lighting Equipment Dealers—The Ambassador, Atlantic City, June 17-19. Herman Plaut, 432 E. 23d St., New York.

American Society for Testing Materials—Chalfonte-Haddon Hall Hotels, Atlantic City, N. J., June 22-26. C. L. Warwick, 1315 Spruce St., Philadelphia.

American Institute of Electrical Engineers—United States Hotel, Saratoga, N. Y., June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

Michigan Electric Light Association—Grand Hotel, Mackinac Island, June 25-27. Herbert Silvester, 401 South Main St., Ann Arbor, Mich.

Walla Walla Rate Case to Be Heard Next Month.—Hearing in the complaint initiated by the city of Walla Walla, Wash., against the Pacific Power & Light Company of Portland, involving the rates, valuations, rules and regulations affecting the company's operations throughout the southern portion of the State of Washington, has been set by the Department of Public Works for June 15 at Walla Walla. The inquiry covers all the company's operations throughout the Yakima and Walla Walla Valley, including the cities, towns and rural districts. The original complaint was filed a year ago by the city of Walla Walla, which asserts that exorbitant rates are based on excessive valuations and that there are a number of generating stations no longer used or needed which should be stricken from the valuations entirely.

Mountain States Power Company Enlarges Its Field.—In addition to the recently announced purchase of the Natrona Power Company of Casper, Wyo., by the Mountain States Power Company of Albany, Ore., the latter company has bought the municipal distribution system at Wheeler, Ore.; the Sublimity (Ore.) Light & Power Company and the Aumsville (Ore.) Light & Power Company. The towns of Sublimity and Aumsville are not far distant from Stayton, the light and power business of which was purchased last year by the Mountain States company. The newly purchased properties will be tied in with Stayton by an 11,000-volt line. The town of Wheeler, Ore., on upper Tillamook Bay, will be served from the system of the Coast Power Company, acquired more recently by the Mountain States company.

Injunction Against Hagerstown Municipal Plant Dissolved.—The injunction that has prevented work on the new municipal light plant indorsed by the voters of Hagerstown, Md., more than two years ago was dissolved last week by Judge F. G. Wagaman at Hagerstown. This project, which will now probably be begun, has been the cause of considerable litigation. In 1923 the courts ruled that the city must have the permission of the Public Service Commission to erect the plant. Last year the Legislature passed an act exempting Hagerstown from the jurisdiction of the commission. The legality of this act was then assailed, but it has been upheld in the decision just given. The plant is to cost $300,000 and will be in competition with that of the Potomac Edison Company.

Men of the Industry

C. J. Griffith New President of Southwestern Division

C. J. Griffith, who was recently elected president of the Southwestern Geographic Division of the National Electric Light Association, entered the public utility field in 1887 as an employee of the Thomson-Houston Electric Company, at first engaging in the installation of electric plants. Later he joined the electric department of the city of Chicago under Professor Barrett, who was city electrician at that time. Subsequently he went to St. Louis and worked on the construction of a generating plant for street lighting. He then served as inspector of service and construction for about a year, after which period he went to

C. J. GRIFFITH

Arkansas with the Western Union Telegraph Company, reconstructing telegraph lines on the Cotton Belt Railroad from Pine Bluff to Texarkana.

In 1892 Mr. Griffith affiliated himself with the City Electric Street Railway Company of Little Rock, Ark., in the capacity of lineman, looking after overhead maintenance. He retained that position for three months, when he was made foreman of shops. Resigning from the employ of that company in 1897, he was engaged from that date until 1901 in the construction of electric and waterworks plants with the Southern Engineering Company of St. Louis. After re-entering the employ of the Little Rock Traction & Electric Company in September, 1901, in the capacity of master mechanic, he was appointed superintendent in 1906, in which capacity he served until 1911, when he was appointed general manager, succeeding D. A. Hegarty, resigned. Mr. Griffith is a native of Churchville, N. Y., and spent his early boyhood in Lafayette, Ind.

Alfred G. Oehler, editor of the *Railway Electrical Engineer* and associate editor of the *Railway Age*, was recently elected president of the American Welding Society for the ensuing year. Before entering the industrial publishing field in 1917 Mr. Oehler had been affiliated with the testing department of the General Electric Company, the electrical department of the Northern Pacific Railway Company and with the Wisconsin-Minnesota Light & Power Company.

Dr. Ing. Adolph, director of the Berliner Städtischen Elektricitätswerke Aktien Gesellschaft of Germany, and **Christian P. Fensen**, director of the Osram Lamp Works, Berlin, are on a visit to this country, making a study of American central stations, and particularly that phase of public utility work dealing with the sale of electricity and the merchandising of apparatus. They plan to visit Boston, New York, Schenectady, Niagara Falls, Cleveland, Chicago, Pittsburgh, Washington, Baltimore and Philadelphia.

Albert E. Dyment, formerly president of the Canadian General Electric Company, was elected to the office of chairman of the board of directors created at the annual meeting on April 30. For many years Mr. Dyment has been a prominent figure in Toronto financial circles. He has been succeeded in the presidency by **D. C. Durland**, who is also a director. **J. H. Black** of Toronto was elected a director to fill the vacancy caused by the death of Sir William Price.

Frank B. Lawton, who has been manager of the gas and electric departments of the Newport News & Hampton Railway, Gas & Electric Company, at Newport News, Va., for the past thirteen years, has been appointed general superintendent of the Consolidated Power & Light Company, Huntington, W. Va. Mr. Lawton was formerly connected with the General Electric Company at Philadelphia and Schenectady and for several years was in charge of the Richmond office of the General Electric Company. The Consolidated Power & Light Company, a subsidiary of the American Electric Power Company, Philadelphia, operates the electric utilities in Huntington and Kenova, W. Va.; Ironton, Ohio; Catlettsburg, Ashland and Russell, Ky.

John W. McCardle, who now is serving his third term as a member of the Indiana Public Service Commission, was unanimously elected chairman at a meeting held May 1. Mr. McCardle succeeds Samuel B. Artman of Lebanon, who has been chairman for the last year, Mr. McCardle being vice-chairman during that period. The commission did not elect a successor to Mr. McCardle. Mr. McCardle began his third term the day of his election. He first was appointed under Governor James P. Goodrich, becoming vice-chairman, and was reappointed by Governor Warren T. McCray. On May 1, 1921, when he began his second term, he was elected chairman to succeed Ernest I. Lewis, continuing as chairman until the election of Mr. Artman. During his service as a member of the commission Mr. McCardle has acted on a number of important rate cases and probably is the best known member of the body.

D. A. Belden Heads Holding Company

David A. Belden of Boston has been elected chairman of the board of the Community Power & Light Company, St. Louis, having assumed his duties at that city on May 15. The Community company owns and controls various lighting, power, gas, water and artificial-ice properties in Missouri, Kansas, Texas and Arkansas. Mr. Belden is widely known in the central-station and electric railway fields. He was born at Aurora, Ill., in 1868 and was educated at Racine College, Racine, Wis. From 1894 to 1901 he was general manager of the Aurora Street Railway and other traction lines in that vicinity. He then became general manager of the Georgia Railway & Electric Company, with headquarters at Atlanta, and left there in 1903 to become general manager of the Birmingham (Ala.) Railway, Light & Power Company. In 1905 he was elected president of the New Hamp-

D. A. BELDEN

shire Electric Railways and subsidiary companies, including traction and lighting properties in the Haverhill (Mass.) and Portsmouth (N. H.) territory, among these utilities being the Portsmouth Power Company, the Kittery (Me.) Electric Light Company and the Massachusetts Northeastern Street Railway.

Mr. Belden was president of the Massachusetts Street Railway Association in 1915-17 and was a member of the special street railway commission to investigate Massachusetts traction conditions in 1919.

Alex Dow, president of the Detroit Edison Company, returned from Europe aboard the White Star liner *Olympic* May 6. Mr. Dow spent two months abroad, chiefly in Italy, in rest and recreation.

H. T. Plumb, electrical engineer connected with the Salt Lake City office of the General Electric Company, is among the forty-three employees of the company to be honored with awards given workers under the Charles A. Coffin foundation for the year 1924. Mr. Plumb has been with the company fourteen years. When the disaster occurred at the Castle Gate coal mine at Castle Gate, Utah, in which an explosion resulted in the death and injury of a large number of miners, Mr. Plumb went to the scene of the disaster and

helped with the rescue work for six days. In addition to the Coffin certificate he was given $250 in General Electric Employees Securities corporation bonds, bearing 8 per cent interest.

Hermann Jahncke, general director; **Alfons Peucker**, technical director, and **Gerhard Harms**, secretary, of the Elektrowerke Aktiengesellschaft, have arrived in the United States to inspect power plants in this country. The trip, covering six weeks, will include visits to Boston, Buffalo, Pittsburgh, Detroit, Chicago, Milwaukee, St. Louis, Schenectady and Keokuk Iowa.

Col. William Kelly, chief engineer of the Federal Power Commission since its creation, is winding up his work preparatory to the assumption of his new duties as director of engineering for the National Electric Light Association. He will retain his title of chief engineer until after a meeting of the commission to be held later this month ,so that he may participate in that meeting, at which a number of important matters must be decided. Colonel Kelly will take a vacation before entering upon his new duties. A detailed account of Mr. Kelly's career was published in the last number of the ELECTRICAL WORLD.

Elmer Ambrose Sperry, engineer, inventor and president of the Sperry Gyroscope Company, has been elected a life member of the National Academy of Sciences at Washington. He is the seventeenth engineer elected to the academy. Mr. Sperry, who has more than four hundred patents to his credit, was one of the founders of the American Institute of Electrical Engineers and of the American Electrochemical Society and chairman of the committee that called the first meeting of the National Electric Light Association.

J. B. Miller, formerly superintendent of construction of the Indiana Power Company, has been made assistant superintendent of overhead construction of the Interstate Public Service Company, which recently purchased the Indiana Power Company. As a result of this change **Virgil Usrey** has succeeded Mr. Miller, with **Arthur Lawson** as his assistant, and **William M. Large** has succeeded Mr. Usrey as district superintendent at Vincennes. **Henry Fitch** has taken the position of district superintendent at Oakland City, formerly occupied by Mr. Large. **Jerome Blaisdell**, formerly superintendent of distribution of the Indiana Power Company, has become electrical engineer of that company.

H. R. Cloud, until recently engaged in power development work with the Pennsylvania Edison Company, has removed to Orlando, Fla., where he is engaged in similar work for the Florida Public Service Company, a subsidiary of the General Gas & Electric Company and under the management of W. S. Barstow Management Association, Inc.

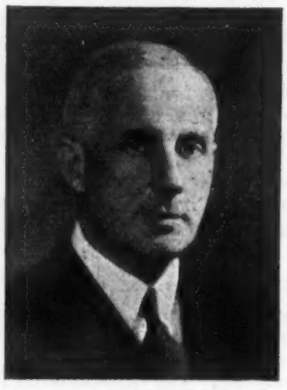
E. C. Murley, who has been associated with the Public Service Commission of Indiana, has recently been appointed manager of the utility office of the Interstate Public Service Company at Columbus, Ind. Mr. Murley is succeeding David McNaughton, who has assumed new duties in Duluth, Minn.

Westinghouse Lamp Elects New Officers

Walter Cary, formerly a vice-president of the Westinghouse Lamp Company, was elected first vice-president at the recent meeting of the board of directors, and T. G. Whaling, formerly

WALTER CARY

general manager, was elected a vice-president. To succeed Mr. Whaling, Arthur E. Allen, formerly manager New York district sales office of the Westinghouse Electric & Manufacturing



T. G. WHALING

Company, has been appointed general manager of the lamp company.

Mr. Cary and Mr. Whaling have been with the Westinghouse Lamp Company since 1904 and 1906 respectively, both

A. E. ALLEN

having been previously associated with the Milwaukee Electric Company in the manufacture of dynamos and motors, Mr. Cary as president and Mr. Whaling as secretary and treasurer. Both are natives of Milwaukee, Mr. Cary having been born in that city in 1871 and Mr. Whaling in 1878. Mr. Cary is a Harvard man, class of 1893, while Mr. Whaling attended Yale University (Sheffield), class of 1900. Soon after becoming connected with the Westinghouse Lamp Company Mr. Cary became its vice-president and general manager and later also a vice-president of the Westinghouse Electric & Manufacturing Company. Mr. Whaling started with the lamp company as assistant to the manager and has held the successive positions of sales manager, assistant general manager, general manager and vice-president.

Arthur E. Allen also has a long record of progress with the Westinghouse organization. Mr. Allen, who is a native of Toronto, Canada, entered the employ of the Westinghouse Electric & Manufacturing Company at the Newark works in 1902, subsequently being placed in charge of the test department. Later he became manager of the supply department of the New York sales office, then executive assistant to the manager, then manager New York district sales office and now general manager of the Westinghouse Lamp Company.

E. M. Herr was re-elected president, L. A. Osborne and C. A. Terry were re-elected as vice-presidents, and James C. Bennett and T. J. Illing were re-elected secretary and treasurer respectively.

Obituary

C. O. Poole, who had been identified with hydro-electric construction in California for the past twenty-five years, died in Los Angeles April 2. A native of Salisbury, Mass., Mr. Poole went to the Pacific Coast in 1883 to take up engineering work. In 1904 he became chief engineer of the Southern Sierras Power Company, Riverside, Cal., and allied companies, resigning one year ago to become consulting engineer.

August Kruesi, formerly engineer of construction of the General Electric Company, died at El Paso, Tex., on May 7 after a lingering illness. He had resigned two years ago because of ill health. Mr. Kruesi was graduated from Union College in 1898, and from then until 1900 was with the British Thomson-Houston Company in London. During the next two years he worked on electrical machine design for the General Electric Company at Schenectady. From 1902 to 1906 he was engaged in the commercial development of the Curtis steam turbine, and from then until 1908 was in the railway engineering department, working on power-house and substation design. Mr. Kruesi was made head of the construction engineering department when it was established in 1908 and continued in that position until he obtained a leave of absence in 1921. When he resigned in 1923, he continued his work with the company in a consulting capacity. Mr. Kruesi was a son of John Kruesi, the early associate of Edison, who in 1886 became manager of what are now the Schenectady works of the General Electric Company.

Commission Rulings

Application of Minimum Charge.—The question of establishing a minimum charge applicable to any premises for which rates are being fixed was considered by the Wisconsin Railroad Commission in a case affecting the Neshonoc Light & Power Company. "This commission," the decision said, "has in a number of cases in the past fixed the status of a customer as follows: 'A customer or unit of service shall consist of any aggregation of space or area occupied for a distinct purpose, such as an apartment, flat, store, office, factory, etc., which is equipped with one or more fixtures for rendering service separate and distinct from other users. Suites of rooms in houses or apartments where complete housekeeping functions (such as cooking) are not exercised will be classified as rooming houses.' We are of the opinion that, under the circumstances in this case, where two or more customers or units of service are supplied through one meter, each customer should be billed for the minimum where the consumption is less than twice the normal amount allowed thereunder. Each step of the rate schedule should be doubled or tripled, etc., depending on the number of customers supplied through the meter, along with the change in the minimum."

Business Corporation Not Subject to Regulation Disapproved as Purchaser of Light and Power Company.—The Public Service Commission of New York in denying consent to the transfer of the capital stock of the Granville Electric & Gas Company, now known as the Eastern New York Electric & Gas Company, to the Granville Power Corporation held that as a business corporation the Granville Power Corporation could not engage in the business of generating and selling electric power to the distributing company, thereby eliminating any consideration of public benefit in the way of increased supply of electricity. The commission said: "As the controlling interest in both companies is the same, it would seem as if the financial requirements of the electric company could best be met through the resources of that company directly instead of through ownership of its stock by petitioner, as in that case its properties would be back of whatever financial aid might be obtained by petitioner in its behalf. The securities offered to the public would be the securities of the petitioner, over which this commission would not possess supervision or regulation, as the petitioner is not an electric or gas corporation as defined by statute."

No Discrimination in Lowering Rates for Consumption in Excess of That Used by Another.—Escanaba and Gladstone, Mich., both purchase power from the Escanaba Power & Traction Company for their municipal plants, and the latter and smaller city protested against a new schedule of rates that would be to the advantage of the former. The Michigan Public Utilities Commission found nothing discriminatory in the rates, saying: "Under the proposed schedule of rates the city of Gladstone and the city of Escanaba will pay exactly the same rates up to the amount of energy consumed by the city of Gladstone. Owing to the steps in the proposed scale the rate for electrical energy decreases with the increased consumption. The amount the city of Escanaba will pay for the electrical energy it uses in excess of the amount used by the city of Gladstone will be considerably less than the average. If the city of Gladstone should use the same amount of energy that the city of Escanaba uses, the two cities would pay identical rates. If this company should sell energy at wholesale to a smaller municipality than Gladstone, the average rate paid by that municipality would be higher than the average rate paid by the city of Gladstone. It is a common practice and an equitable practice that the larger the volume of consumption the lower the average rate. To allow the city of Gladstone a rate which would maintain the present differential of 39 per cent would be to allow the city of Gladstone to get a cheaper rate than the city of Escanaba."

Maryland Commission Commends Bell Telephone System as Contrasted with Public Ownership in Europe.—In handing down its decision in the rate case affecting the Chesapeake & Potomac Telephone Company—a case which has been widely noticed because of the quick reversal by the United States District Court of its valuation theory (already noted in the ELECTRICAL WORLD)—the Maryland Public Service Commission took occasion to eulogize the telephone system of the United States, saying: "The commission in reaching the conclusions herein given does not want it to appear that it is criticising the efficient Bell Telephone System, covering the entire country and making available to the people of this state a nation-wide means of communication. The system as developed gives the people of this country the best and most economical telephone service in the world and is more universally used than in any other country. About 63 per cent of all the telephones in the world are in the United States. There are 13.1 telephones in this country for every 100 population, while in Europe there are only 1.2 telephones per 100 population. The telephone development in this country has been entirely by private companies, while in Europe the development has been mostly under government ownership. The highest telephone development in any country in Europe, 8.3 telephones per 100 population, is in Denmark, where the telephone service is operated almost entirely by private companies. This commission, furthermore, believes that government ownership of telephones in this country would not operate for the best interests of the telephone user." The commission said its criticism of the local and national telephone companies was not aimed at the telephone system, but at the division of the expenses and revenues between the parent company and its subsidiary."

Recent Court Decisions

Georgia Act Does Not Preclude Recovery from Third Party of More than Compensation Received from Employer.—The Georgia Supreme Court has decreed that nothing in the workmen's compensation law of that state prevents recovery from a third party who is negligently responsible for the death of a workman of more than the sum allowed under the compensation act. In this case (Athens Railway & Electric Company vs. Kinney) an employee of a cotton mill was killed by touching an 11,000-volt wire belonging to the power company in the substation of the mill where he was employed. Workmen employed by the power company had been engaged in work on this substation and had cut the wires which furnished light to the mill without notifying Kinney, who was in charge of the mill's electrical equipment. While attempting, as was his duty, to find the cause of the light failure, he came in contact with the wires, which had been left hanging loose, and was killed. His widow sued the Athens Railway & Electric Company for an amount much larger than her compensation from her husband's employer, which she was already receiving. She was granted the damages asked in the lower courts, and this judgment has been affirmed by the Supreme Court in the decision here noted. (127 S. E. 290.)*

State Income Tax Not Assessable on Rental Where Plant of One Utility Has Been Leased to Another.—The Wisconsin Supreme Court had to deal in Wisconsin Electric Power Company vs. Town of Lake with a power company organized with right to manufacture, generate and sell electricity which had leased the land on which its power plant stood to a traction company engaged as a public utility in operating a street and interurban railway and in generating and selling electrical energy for power purposes, under an agreement that the traction company was to pay all the taxes. The power plant was reported for taxation by the traction company pursuant to the utilities statutes and the tax was paid. The electric power company, under protest, made a return to the tax commission of its income for the year 1921. Virtually all of this income was the rental received from the traction company. The court held that the electric power company was a public utility and was subject to taxation as such, even though it leased its property to the traction company and no longer operated its plant, and that "the plaintiff and the traction company should be taxed as an entity, that it is immaterial that the traction company, while operating the power plant in connection with the railway, is doing so as lessee and not as owner, and that neither company could be properly assessed for an income tax." (202 N. W. 195.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Is Reciprocity Wise?

Purchasing Should Not Be Mixed with Selling—Dangers Pointed Out—Free Competition Safest Policy

BY A MANUFACTURER

THE practice of so-called "reciprocity" has in it much potential harm for manufacturers of electrical apparatus. This practice may exist between one electrical manufacturer and another, or it may be carried on between an electrical apparatus manufacturer and a producer of raw or process material used in the manufacture of electrical goods. A brief statement of this policy is: "You buy all your raw material from me and I will buy all my electrical apparatus from you."

The actual working of the practice may often be as follows: The representative of an electrical manufacturer calls on the purchasing agent of the producer of basic or process material. Before the purchasing agent will entertain the proposition on the electrical manufacturer's equipment, the sales manager will be called in and the sales records will be inspected to determine to what extent the electrical manufacturer has made purchases of material from this particular producer. In many cases, if the records show only small purchases from this particular electrical manufacturer, it is difficult for him to get a satisfactory hearing. This mixing of purchasing and sales can scarcely be anything but harmful in the long run, as it ties the hand of the purchasing agent, not permitting him to select material on the basis of his engineer's specifications, and it jeopardizes the ability of the sales department to sell any material to this particular electrical manufacturer.

RECIPROCITY RESTRICTS MARKET

The eventual outcome of the policy of reciprocity must always be a restricted market for those manufacturers who practice it and a serious obstacle to the free development and sale of all types and classes of apparatus. Referring to the situation outlined in the preceding paragraph, it will be appreciated that those manufacturers of electrical apparatus who are arbitrarily shut out of any opportunity to do business with any particular manufacturer of material will probably retaliate by absolutely refusing to purchase any material whatever from this producer. This decision will in turn be reached by each selling manufacturer as he is confronted with the situation with the result that before long the producer of raw material or other products who will not buy from any one to whom he cannot sell will find it impossible for his sales department to sell to any one from whom he does not buy. Such a condition amounts to a severe restriction of markets for the producer of raw materials.

Contrasted with the dangers of the policy of reciprocity is the safer policy of free competition in buying and selling. Under such a program the purchaser will always be able to make a selection from a greater number of articles representing the thought and production achievement of a large number of manufacturers instead of being confined to the product of one manufacturer. A good purchasing agent will nearly always be able to make a better purchase, one more suited to the actual conditions to be met by the product purchased, if free competition between manufacturers is encouraged. Furthermore, progress and development in design and application of apparatus is hindered by a policy of restricted markets resulting from reciprocity, whereas with open competition free play is given to the abilities of all manufacturers to produce the best type of a given commodity at the lowest price.

Analyzing Salesmen's Calls

Substantial Increase in Territorial Coverage Results from Careful Analysis as Outlined by One Company

BY C. A. NORTON

District Manager Westinghouse Lamp Company, Boston, Mass.

A SYSTEM was placed in service a little over a year ago in the Boston office of the Westinghouse Lamp Company whereby a record of the sales coverage of the territory has been kept in such a way that the number of visits made to the various towns has been known at regular periods to the field men. The result of this system has been that the coverage of these places has been substantially increased and considerable light has been thrown upon the cost of such activities. In the New England territory covered from the Boston office of the company there are about 900 cities and towns of more than 600 inhabitants which are served by privately owned electric light and power companies, so that it becomes important to have a record of the sales coverage of the territory. All field salesmen working from this office as a base are required to send daily reports of their calls to headquarters. From these reports a clerk makes up once in six months a tabulation showing the number of visits each field salesman has made to each town in his territory in terms of visits per month. This tabulation takes about two weeks, and a copy is sent by the manager to each field man in order that the salesman may have the benefit of the check. No attempt is made to set up a bogey for any salesman or to run a contest in coverage.

The occupation of certain parts of the territory by centralized management groups makes competitive comparisons undesirable, and so only the individual salesman's record of calls is sent him. A typical report reproduced herewith shows a marked increase in the number of towns visited since the system was started as compared with the visits made by the salesman in the

ANALYSIS OF SALESMAN'S VISIT

(Note larger number of visits and improved coverage during the second six-month period after system was started.)

Town or City	Population	First Six Months						Second Six Months					
		1923 Oct.	1923 Nov.	1923 Dec.	1924 Jan.	1924 Feb.	1924 Mar.	1924 April	1924 May	1924 June	1924 July	1924 Aug.	1924 Sept.
A	1,000												
B	1,000												
C	800							1	1				3
D	1,200												
E	5,874				1								1
F	3,897	1	1										
G	1,273									1			
H	11,375							1		1			1
I	24,174	1	2		2	1	2	2		1	1	1	3
J	1,500												
K	5,670												
L	29,407	2	2	1			1		1	2	1		1
M	1,000	1											
N	3,290	1	1			1							
O	21,793	2		1	2	2	1	4		2	2		2
P	800											1	
Q	600							1				1	
R	900								1			2	2
S	1,100								1				
T	1,675												
U	6,855							1	3	1			
V	1,000												
W	1,276												
X	3,700												
Y	6,000												
Z	1,708												
AA	1,250							1					
BB	3,500	1											
CC	30,255	1		1	—	1		2	1	2	1		3
DD	502							2	1	3	5		1
EE	7,697												
FF	3,200										2		

preceding six months. The system also has the effect of increasing the number of calls made within each town.

In establishing this means of keeping track of salesmen's visits the towns were allocated to the field men. To lay out the lists and assign them to the field men took two girls about four weeks. Once the system was established it became an easy matter to handle it from the daily call reports, although these are gone over for this purpose only twice a year.

For the manager's use an analysis of the cost per visit and per call is made up semi-annually. This summary shows the number of towns listed in each man's territory, the number of towns visited, the percentage of the total number visited, the total number of calls made, traveling expenses, cost per town in the territory, cost per town visited, cost per visit and cost per call. One of the chief advantages of this method is its substitution of an accurate check for the field salesman's memory as to coverage. A more balanced coverage tends to result from the disclosure of uneven territorial visiting.

Ideal Refrigerator Motor Specified

Joint Meeting in Cleveland Presents Needs of Situation—Voltage Fluctuation a Serious Embarrassment in Several Cases, Say Manufacturers

THE discussion of the need for improvements in the electric motors used with automatic electric refrigerating equipment has been given a very definite direction at a joint meeting just held in Cleveland by the representatives of the refrigerator and motor manufacturers under the auspices of the electric refrigerator committee of the National Electric Light Association. This meeting was the direct outgrowth of the meeting held in New York City early this year, and reported in the February 28 issue of the ELECTRICAL WORLD, to consider the program of investigation and test which is being conducted by special committees of both the National Electric Light Association and the Association of Edison Illuminating Companies. At that time the refrigerator manufacturers were unanimous in their plea for improved characteristics in electric motors used in refrigeration service, even though it might entail an increase in the motor cost. The purpose of the Cleveland meeting was to arrive, through joint discussion, at a definition of what is actually desired and required to provide a practically perfect refrigerator motor. Nine refrigerator manufacturers, eleven motor manufacturers and the Electric Power Club were represented. Prof. B. F. Baily of Ann Arbor, Mich., an expert on motor design; R. R. Young of the Public Service Electric & Gas Company, and Chairman G. E. Miller of the Cleveland Electric Illuminating Company, members of the N. E. L. A. committee and other central-station men were also present.

RECOMMENDATIONS MADE

At the Cleveland meeting the refrigerator manufacturers drew up and presented for the consideration of the motor manufacturers and the central-station industry the following recommendations:

1. *Continuity of Service.*—This is of prime importance, as satisfactory performance of refrigerating equipment depends entirely upon a motor which will give continuous and satisfactory performance.

2. *Proper Voltage Regulation.*—This comes directly under the supervision of the central-station company and must be corrected by it. Conditions are experienced where voltage regulation varies from a normal of 115 to as low as 80 to 85. It has been found that this condition usually exists in outlying districts, which of course are the principal field in which household refrigeration is now sold, and where in providing proper service the service calls are found expensive.

3. *Noise.*—Motors should be made as uniformly quiet as possible, and while certain types of motors give good service in this respect, it has been found that with those having brushes which ride continuously through the operation, the question of noise is one that must have due consideration. Noise also apparently results from lack of uniformity, air gap, and at times from loose laminations. More careful inspection at the factory should eliminate much of this difficulty.

4. *Armature Flotation.*—Motor end play is found excessive in some places, a condition which results in excessive motor noise. This should be held to a uniform standard. It has been found that the noise is more pronounced where V-type belts are used.

5. *Starting Torque, Efficiency and Power Factor.*—The experience of refrigerating machine manufacturers indicates lack of uniformity in the matter of starting torque, efficiency and power factor. This also can be corrected through proper inspection and testing by the motor manufacturer.

6. *Lubrication.*—Motor lubrication should be arranged to assure not less than one year's continuous service of equipment with one oiling.

7. *Brush Life.*—Brush life to provide at least one year's continuous full load service should be provided.

8. *Accessibility for Servicing.*—Difficulty has been experienced with the servicing of motors in the replacement of brushes, brush rigging and brush lifting mechanism. This can be corrected by approved design of end bells.

9. *Motor Bearings.*—The size and quality of motor bearings used should be so designed as to provide not less than a five-year service without replacement. It is assumed, of course, that proper lubrication will be provided.

10. *Impregnation of Motor Windings.*—Care should be used in the impregnation of motor windings to assure motors being as free from trouble due to moisture as possible. This is especially essential where equipment is operated in excessively damp places and on certain export work.

11. *Standardization of Motor Mountings.*—If it were possible to obtain a uniform or standardized motor mounting base, this would be helpful to the refrigerator manufacturer and also to his dealer.

12. *Price.*—While it is recognized that some of the conditions named above will entail slight additional cost, still with larger production on the part of the manufacturers of refrigerating equipment the cost of motors should show a material decrease. The motor cost today represents a substantial part of the refrigerating machine cost.

In discussing these recommendations at length the refrigerator manufacturers seemed to feel that there were very few motors on the market which could claim real continuity of service for refrigeration work. The motor manufacturers brought out the point that there was no need of the motor alone being able to perform for sustained periods without attention unless the compressor units and other parts were equally good in that respect. The motor manufacturers pointed out that the compressor unit should be so designed that as it grows older in service it would not impose additional duty on the motor. There had been some complaint on that score in the past, because compressor units as they continued in service required more power or more frequent and continuous operation, due to wearing of parts.

LOW VOLTAGE A SOURCE OF COMPLAINT

There was a very general complaint from both refrigerator and motor manufacturers that they too frequently found the supply of electric power in residences inadequate for proper operation of these devices. Some representatives said that they had frequently found the supply as low as 70 volts, which, of course, is altogether inadequate for this service, as well as for general service in the home. This was a very general complaint, the statement being made that this condition was found to exist even in the larger centers and on the lines of operating companies in our larger cities, as well as on the properties of the smaller central-station companies. One refrigerator manufacturer said he had met with considerable indifference on the part of some central-station companies toward improving this condition.

The chairman requested that refrigerator manufacturers obtain statements from their field representatives regarding this particular condition and said that if these were sent to him promptly he would attempt to get this point across to the central-station companies at the San Francisco convention of the N. E. L. A. with a view to bringing about an improvement. There seems to be no excuse, he said, for this condition to exist in a well-managed central-station company, after its attention has been called to the matter, as obviously the central-station company cannot hope to profit by the installation of these and similar electrical appliances unless its service is adequate to operate them satisfactorily.

The subject of noise was discussed quite at length by members of all three groups, every one recognizing the seriousness of noisy equipment. There was no disposition evident to shift the responsibility from one manufacturer to another; every one seemed to be willing to co-operate with a view to improving all of the equipment entering into these units. It was pointed out that direct-current motors were giving considerable trouble because of noise. One of the motor manufacturers said that this was probably due to the fact that not so much attention had been given to direct-current motor design and construction as had been given to alternating-current motors, because the latter are used in so much greater numbers.

It is often very difficult to determine just what causes the real disturbance in the way of noise. It is a combination due to magnetic hum in the motor, rotation of reciprocating parts, belts, idlers, clicking of valves, etc. Refrigerator manufacturers point out the lack of uniformity in the quiet operation of motors of the same design and from the same manufacturer. The

motor manufacturers said that to reduce the noise materially would increase costs because of the necessity for very much finer manufacturing specifications, inspections, etc., and that it would probably be impossible to get a noiseless single-phase motor of ¼ hp. capacity. It was pointed out by the motor manufacturers that size of motor is a very big factor in noiseless operation; that while alternating-current motors are made for such applications as talking machines, player pianos, etc., such motors are very small in size, and that particular effort had been made in their applications in the way of mounting, housing, etc., to eliminate noise disturbance.

A number of refrigerator manufacturers felt that there were very few motors on the market at the present time which were satisfactory, particularly as regards starting torque. One company is now using motors which are entirely satisfactory with performance as follows: Starting torque, 3 to 3½ ft.-lb.; efficiency, 64 per cent; power factor, 69 per cent. The representative of the company said that very few motors offered today would meet the above performance. He made the further statement that these motors would start the load on from 80 volts to 85 volts.

Refrigerator manufacturers felt there should be a trend downward in prices, particularly in view of the coming increasing production. Motor manufacturers expressed themselves to the effect that up to the present time motors have been sold for this work at little or no profit to the manufacturer. C. H. Garcelon, speaking for the motor manufacturers' committee, said they felt that the type and quality of motor required by the refrigerator manufacturers would increase the cost 50 per cent over the present prevailing prices.

In considering what definite steps could be taken to bring about an adjustment of the viewpoints of the refrigerator and the motor manufacturers and the development of what might be called a perfect refrigerator motor the need for an association of the refrigerator manufacturers was stressed. Meanwhile it was recommended that a smaller joint committee be established to continue working toward an agreement. The motor manufacturers, through the Electric Power Club, promised to give careful consideration to these recommendations.

Business Conditions

CENTRAL-STATION companies have been placing many orders for equipment and supplies to cover extensions and improvements. There are no particularly large sales, but the volume is good and many inquiries are being received by manufacturers. Industrial companies are buying a fair amount of supplies, and the steel companies are quite active. Many deals are in prospect with the steel industry, and some good additional quotations have been furnished.

The United States Steel Corporation announced a drop of 416,996 tons in unfilled orders at the end of April. Unfilled orders are thus at the lowest point since last November. Shipments have been large, but consumption is good and buying conservative, thus accounting largely for the decrease that has been noted in unfilled orders. Stocks in that industry are said to be rather light.

In New England the demand for industrial lighting has been quite active, and sales of central-station supplies continue active. Many small orders for switching equipment and construction material have been placed in the New York district by central-station companies. Business in that district is spotty but in good volume, and industrial companies are placing good orders for supplies. In the Southeast central-station companies are actively engaged in extensions and improvements, and building construction continues active, particularly in Florida and Alabama. The demand for appliances in that district has improved very much. Sales are good in the Middle West and the volume is increasing. Heavier purchasing of apparatus by the various utility companies in that territory is noticeable. On the Pacific Coast orders received mainly cover special lines, and sales have declined from the volume reached early in the month.

Metal Market Dull—Prices Steady—Lead Fairly Active

WITH the single exception of lead, the metal markets have been dull and only moderately active. Neither producers nor consumers have shown much interest in selling or buying. Prices, however, have held fairly steady. Sales of copper have been light. Several producers were completely out of the market lately but have not lost much business as a consequence. Consumption of copper by the domestic manufacturing industries is splendid. Export demand has also been good, with Germany and England remaining the chief buyers.

The contract price for New York lead, set by the American Smelting & Refining Company, continues at 7¼ cents. The good demand for lead which has characterized the metal markets since April 22 has continued. Those producers who had any lead made comparatively large sales but some found themselves so well sold up or had their production so well covered by specifications on contracts that they had little to offer. The demand for lead has been well distributed among the various classes of consumers, though cable companies have been perhaps a little more active than usual. Galvanizers have exhibited little interest in purchasing zinc so that few sales were made. Fluctuations in the tin market have been remarkably narrow during the week. Sales of this metal have not equaled consumption.

NEW YORK METAL MARKET PRICES

	May 6, 1925 Cents per Pound	May 13, 1925 Cents per Pound
Copper, electrolytic	13.6	13.57½–13.62½
Lead, Am. S. & R. price	7¼	7¼
Antimony	12¼	17¼
Nickel, ingot	31	31
Zinc, spot	7.30–7.30	7.30–7.35
Tin, Straits	54	54½
Aluminum, 98 to 99 per cent	28	28

Base copper price May 13, 1925, 16 cents.

April Building Contracts Largest Monthly Total on Record

THE April volume of building contracts was the largest monthly total on record according to the F. W. Dodge Corporation. Contracts awarded last month in the thirty-six Eastern States (which include about seven-eighths of the total construction volume of the country) amounted to $546,970,700. This was an increase of 14 per cent over March and 13 per cent over April of last year. Last month's record included the following important items: $256,414,300, or 47 per cent of all construction, for residential buildings; $95,432,400, or 17 per cent, for public works and utilities; $63,968,900, or 12 per cent, for commercial buildings; $46,567,900, or 9 per cent, for industrial buildings, and $33,154,600, or 6 per cent, for educational buildings.

Total construction started during the first four months of this year has amounted to $1,623,540,000, compared with $1,515,043,200 for the first four months of last year. The gain is a little over 7 per cent. Of the $108,000,000 increase to date this year, $52,000,000 represents the gain in public works and utilities projects. In addition to the big gains in actual work started there is also a big gain in prospective work. Contemplated new projects reported in April amounted to $760,657,600, an increase of 25 per cent over the amount reported in April of last year.

Central-Station Construction Active in Southeast

ELECTRIC light and power companies in the Southeast are actively engaged in extensions and improvements, and steady sales of construction and supply materials, are reported, though no notably large orders have been placed recently. The construction of high-tension lines by the larger central-station companies is reflected in the satisfactory movement of construction materials of the high-tension type, ranging from 22,000 volts to 110,000 volts. The textile business is again showing signs of life, one large mill in North Georgia having last week decided to electrify. Contracts for the equipment will be let in the next few weeks.

A general improvement is reported in practically all jobbing lines. Building construction in the territory, especially in Florida and Alabama, continues active. Appliance lines, which have been somewhat quiet of late, are taking on new life and a satisfactory volume of orders has been placed. One of the largest appliance manufacturers states that its socket appliance business is 8 per cent ahead of the same time last year, while electric ranges are selling

in 50 per cent greater volume than during the same period of 1924. Panelboard and switchboard business is quiet, and fans are in good demand, even a little better than was anticipated this early in the season.

Demand Spotty, Sales in Good Volume, in New York District

CENTRAL-STATION companies are buying material steadily in the New York district. Many small orders have been placed for switching equipment and pole-line and other construction material. One order covered 33,000-volt transformer and switchboard equipment. Several inquiries have been received and many orders are pending. Business is generally referred to as spotty but in good volume. One central-station company reports many orders pending awaiting the completion of engineering work.

The demand for general-purpose motors is quiet, but steel companies and associated companies continue actively in the market for mill-type motors. Much business is in prospect from that source, and some large orders are expected soon. One proposition covers approximately $20,000 worth of motors and another $35,000 worth. This is in addition to a much larger amount of material previously quoted on but not yet purchased. Jobbers report that the recent improvement in sales is holding up, with orders mainly from industrial firms instead of contractors. Manufacturers are receiving fan orders in better volume than anticipated for this period.

Good Industrial Lighting Demand in the New England District

THE demand for industrial lighting has been quite active in the New England district. Brisk interest and increasing installations in factories are reported by one group of central-station companies. The Boston Edison Company reports two substantial contracts for factory lighting amounting to over $4,000 and another, amounting to over $20,000, is expected to be closed soon. Central-station supplies continue to maintain a steady level in selling. Seven cars of chestnut poles were delivered during the week, and two contracts for general station equipment for Connecticut, amounting to about $5,000, were reported by a jobber. There is a fair demand for wire, pole-line hardware and cross-arms.

Sales of general-purpose motors remain spotty and are confined to single orders. Domestic appliances are moving in encouraging volume. A Vermont central-station company reports the sale of twenty-three washing machines in the past month and a recent installation of two ice-cream cabinets.

Orders on Pacific Coast Cover Special Lines—Sales Decline

SPECIAL lines predominate in the present ordering on the Pacific Coast, while staple lines are selling in exceedingly small quantities. Business, though it improved early in the month, has again fallen off. Railroad purchasing is brisk and is largely for reflectors and wiring supplies. Both rigid and flexible metallic conduit are selling well. Prices on small single-phase motors have dropped slightly owing to frame changes. Rubber-covered wire sales are improving.

Power-company buying has been quiet. The sale of 1,500 line switches for 7,500-volt service is reported from southern California. Range business is steadily improving. Two hundred units were sold during April by the Municipal Lighting Department of Seattle, and considerably more were sold in that period by the Puget Sound Power & Light Company. Among the larger orders placed during the week are one for two carloads of cross-arms and another for 250 externally operated switches for a Shasta lumber company. Poles and construction tools are in little demand by power companies owing to large purchases made in 1924.

Sales Good in Middle West—Volume Increasing

BUSINESS remains in a satisfactory condition in the Middle West, with increasing volume. Heavier purchasing of apparatus by the various utility companies is noticeable. Among the interesting items are a complete condensing equipment for a 77,000-kw. turbo-generator, six 600-amp. and two 2,000-amp., 15,000-volt, three-pole, single-throw, horizontal, isolated-phase, hydraulically operated oil circuit breakers, and one 600-amp., 132,000-volt, three-pole, single-throw outdoor-type, solenoid-operated oil circuit breaker. Quite an extensive construction program is under way and several large substations are in the course of construction in the Chicago district. A power contract for 10,000 hp. in electric service has been signed by the Kokomo Steel & Wire Company for the operation of its large rod and wire mills at Kokomo, Ind. The energy requirements will amount to more than 20,000,000 kw-hr. annually.

Satisfactory sales are reported by the jobbers. While the volume of business has not been exceptionally large, optimism is prevalent. Appliance sales have been somewhat better. One manufacturer of vacuum cleaners reports receiving a single order for 1,000 cleaners. A reduction of 2½ per cent to 3 per cent was announced in the prices of code wire.

Activities of the Trade

Western Electric Sales Show Decrease for First Quarter

Sales of the Western Electric Company during the first three months of 1925 amounted to $69,761,000. Orders received during this period were $71,253,000, as against $80,591,000 for the corresponding period of 1924. This decrease marks the anticipated falling off of the extraordinary demand for telephone equipment to more normal levels. Sales reported for the month of March, 1925, were $25,821,000, and the value of unfilled orders on hand at the close of the first quarter was $93,506,000.

National Lamp Works Announces Changes in Sales Divisions

Several changes in sales divisions of the National Lamp Works of General Electric Company have been announced as effective since May 1. The name of the Federal Miniature Lamp Division of New York City has been changed to the Federal Lamp Division, National Lamp Works of General Electric Company. The offices of the Federal Lamp Division have been moved from 342 Madison Avenue to 441 Lexington Avenue. The name of the Shelby Lamp Division of the National Lamp Works, Jackson Building, Buffalo, N. Y., has also been changed to the Empire Lamp Division, National Lamp Works of General Electric Company.

The offices of the Bryan-Marsh Division, National Lamp Works of General Electric Company, Grand Central Terminal Building, New York, have been changed to 250 Park Avenue. The name of the Bryan Marsh Division, National Lamp Works of General Electric Company, 623 South Wabash Avenue, Chicago, has been changed to the Midland Lamp Division, National Lamp Works of General Electric Company. The name of the Bryan Marsh Division, National Lamp Works of General Electric Company, at 642 Beaubien Street, Detroit, has been changed to the Michigan Lamp Division, National Lamp Works of General Electric Company.

Westinghouse Gets Order for Railway Electrification

The Westinghouse Electric & Manufacturing Company has closed a contract with the Great Northern Railway Company for four electric locomotives and other equipment, to be used for the railroad's Cascade Mountain grade electrification, extending from Skykomish, Wash., at sea level through the Cascade Tunnel to the Summit. This electrification, which will cost $1,000,000, will be undertaken immediately and is planned for completion within twelve months. The electric locomotives will utilize direct-current motors operated from a single-phase, high-voltage, alternating-current trolley through the medium of a motor-generator set. This is similar to the locomotive recently built by the same manufacturer for Henry Ford's Detroit & Ironton Railroad. Hydro-electric power will be used.

The Allen-Bradley Company, Milwaukee, manufacturer of control equipment, etc., announces the removal of its Chicago office to Great Northern Building, room 912.

The Providence Insulated Wire Company, Wadsworth Street, Providence, R.I., has awarded a contract for the erection of a one-story brick addition to its present plant, 65 ft. x 125 ft.

The Industrial Works, Bay City, Mich., manufacturers of locomotive cranes and crane equipment, announce the opening of two new district offices at 425 Whitney Central Building, New Orleans, in

charge of John A. Abele, and at 843-A Hurt Building, Atlanta, in charge of John J. Murphy. The company also announces the appointment of Douglas J. Calder, Conway J. Neacy and Monroe J. Frankel as district sales engineers at the Chicago district office and that of Chester F. Delbridge, also as district sales engineer, at the St. Louis office.

The York Insulated Wire Works of the General Electric Company announces that its offices have been moved from 1737 Broadway, New York, to room 2446, 120 Broadway, New York. The company also announces that Murray H. Owen, who has been connected with the merchandise department of the General Electric Company for several years, has been transferred to the York Insulated Wire Works for general sales promotion of "Deltabeston" and "Salamander" asbestos insulated wires and cables.

The Sundh Electric Company, Inc., 5 Avenue C, Newark, N. J., announces the removal of its Chicago offices from 122 South Michigan Avenue to 310 South Michigan Avenue.

The Robbins & Myers Company, Springfield, Ohio, manufacturer of electric motors, generators and fans, announces the removal of its Chicago district sales offices to room 1825, Transportation Building, 608 South Dearborn Street.

The Display Stage Lighting Company, Inc., 334 West Forty-fourth Street, New York, announces that it has placed on the market a new type of fire log electrically operated and controlled by a rheostat.

The Farrell's Product Company, Dowagiac, Mich., manufacturer of electric washing machines, is arranging to expand its plant to care for a considerable increase in output.

The Merrill Electric Supply Company, electrical jobber, has moved from 38 Exchange Street to new quarters at 175 Summer Street, Worcester, Mass., where about 10,000 sq.ft. of floor space will be occupied—approximately double the area covered in the former location.

The Lighting Educational Committee, 680 Fifth Avenue, New York, announces that it has available for free distribution its surplus stock of "home-lighting primers," which will be sent express collect in any quantity ordered as long as the stock lasts.

The X-Ray Reflector Company of New York, 31 West Forty-sixth Street, New York City, announces that, paralleling the action of the parent company, Curtis Lighting, Inc., of Chicago, the company has changed its name to Curtis Lighting of New York, Inc.

The Ridgway Dynamo & Engine Company, Ridgway, Pa., has received an order, amounting to approximately $60,000, from the United States Shipping Board for forty-two direct-current generators for oil engine drive.

C. Brandes, Inc., manufacturer of radio apparatus, announces the removal of its New York factory to its new plant at 200 Mount Pleasant Avenue, Newark, N. J. The executive offices of the company are now at the Newark factory. For the present the office of the vice-president, M. C. Rypinski, and the sales and advertising departments will be at 237 Lafayette Street, New York City.

Percival Robert Moses, electrical engineer, announces the removal of his offices to 250 Park Avenue, New York City.

The Westinghouse Lamp Company announces that it has developed a campaign in co-operation with the merchandising section of the Westinghouse Electric & Manufacturing Company to enable electrical dealers to capitalize on the recent national campaign for home lighting.

New Equipment Available

Quick-Trip Graphic Meter

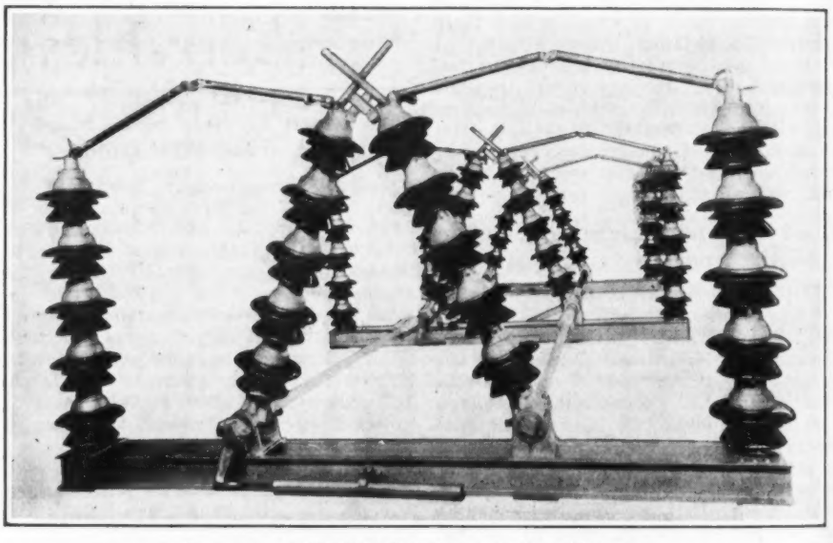
A quick-trip graphic meter with an attachment which automatically increases the rate of chart feed from inches per hour to inches per second in one-twenty-fifth of a second has been placed on the market by the Esterline-Angus Company, Indianapolis. The instruments are standard except for the quick-trip attachment, which consists of a small electric motor mounted on the side of the meter case and arranged to drive the chart. The chart is normally driven by the clock at the desired hourly chart speed, and the gears between the motor and the chart drive roll are disengaged.

When the relay in the circuit acts, it closes a circuit through an electromagnet placed near the motor, which instantly meshes the gears connecting the motor shaft to the drive roll. The small motor runs continuously, so that the time required to speed up the chart is only that necessary to engage the gears, which is less than one-twenty-fifth of a second. The chart is operated at high speed as long as the relay is closed and the electromagnet energized. As soon as the disturbance is over the electromagnet releases, but a cam keeps the gears in mesh until the chart comes to the proper time, when the gears disengage and the clock drives the chart again.

Water Cooler. — A "Frigidaire" equipped automatic water cooler for use in factories, offices, schools, restaurants, hospitals, etc., has been placed on the market by the Delco-Light Company, Dayton, Ohio. This equipment can be used in connection with most standard types of water coolers. The compressor may be installed in the basement or in any convenient place within 50 ft. of the water cooler.

Motor-Operated 220-Kv. Disconnecting Switch

A new type of disconnecting switch developed for use on 220-kv. transmission lines has been placed on the market by the Electric Power Equipment Corporation, 412 North Eighteenth Street, Philadelphia. The switch is motor-operated. The switchgear has a 12-in. crank throw and is equipped with a precision stop to prevent any overtravel of the switch and with an automatic clutch to release the motor for manual operation of the gear. The switch can be opened or closed by hand.



SWITCH FOR 220-KV. SERVICE IN CLOSED POSITION

The switch weighs 9,850 lb. complete and rests on three 8-in. channel irons, one for each phase, as shown in the illustration. The moving connecting cables are carried through 2-in. brass tubing with movable joints of cast bronze. The phosphor spring bronze double contact used closes over a cast-brass contact, which is made unusually heavy for mechanical reasons. There is a distance of 10 ft. between switch points in the open position. Each stack of insulators is individually counterbalanced by incased oil-tempered coil springs, which have a pressure of 750 lb. compressed. There is a total of twelve springs, four to each phase. The three phases are spaced 15 ft. apart and are operated by two cast-steel shafts, 3 in. square, through a 1-hp. motor.

New Trade Literature

SWITCHES.—The Circle F Manufacturing Company, Trenton, N. J., is distributing a folder covering its shallow-type switches.

COLLAR OILING BEARING.—The Hill Clutch Machine & Foundry Company, Cleveland, Ohio, is distributing bulletin No. 112, covering the Hill collar oiling bearing, "Cleveland" type.

ARC-WELDED BUILDINGS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued folder No. 4,657, in which it describes how the Chicago, Burlington & Quincy Railroad Company constructed structural steel buildings entirely with arc-welded joints. Illustrations of the building are shown at various stages of construction. An interesting comparison is made of the erection of costs of the arc-welded buildings with those of riveted buildings.

SAFETY MOTOR STARTERS.—A small booklet issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., describes and illustrates its "WK" line of safety motor starters, which are manufactured in three types, WK-10, WK-20 and WK-22, with capacities ranging from the smallest motor up to those of 7½ hp., 550 volts. Descriptions are also given of special junction boxes and pedestal designed for use with these motors.

PLANER CONTROLLERS.—"Automatic Control for Planers Direct-Connected to Motors" is the title of publication C-14 issued by the Cutler-Hammer Manufacturing Company, Milwaukee, which deals with the application of "C-H" automatic controllers to planers direct-connected to motors.

OUTLETS. — Harvey Hubbell, Inc., Bridgeport, Conn., is distributing a folder describing the Hubbell "Twin Te-tap" for use with both standard outlets and Edison screw-base receptacles.

ELECTRIC SPEED INDICATOR.—Bulletin No. 3,004-A issued by the Weston Electrical Instrument Corporation, Newark, N. J., covers the Weston electric speed indicator, model 44, type 4 magneto, an electrical device for indicating the speed of rotation of any piece of revolving machinery. It contains a description and a graph of the results of the first endurance test of the model 44 magneto.

ELECTRICAL SUPPLIES, RADIO APPARATUS, ETC.—The Julius Andrae & Sons Company, Broadway and Michigan Street, Milwaukee, has issued general catalog No. 58, covering the products it distributes. It contains 960 pages, in which is covered a complete list of electrical supplies, machinery, appliances, fixtures, radio apparatus, etc., which it carries. The 1923 "National Electrical Code," as well as a number of useful tables and other data, is included.

DISCONNECTING SWITCHES. — Bulletin No. 6,000 issued by the Pacific Electric Manufacturing Company, 5815 Third Street, San Francisco, describes its full line of full-floating disconnecting switches. They range in capacity from 300 amp. to 6,000 amp. and in voltage rating from 11 kv. to 135 kv.

LIGHTNING ARRESTERS. — Circular 1,695-A issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, describes the "Autovalve" lightning arrester. Attention is called to various features of this new type of arrester from the standpoint of performance requirements and safety. A description of the "SV" station-type arrester, the "LV" distribution-type arrester and the "LV" arrester for secondary circuits is included.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Leicester, England (No. 14,917), of household electrical equipment, radio sets and parts and coil-winding machines for electrical engineers.

Purchase and agency is desired in Ahmedabad, India (No. 14,929), for pocket lamps and batteries.

Purchase and agency is desired in Budapest, Hungary (No. 14,912), for lighting fixtures.

An agency is desired in Lwow, Poland (No. 14,928), for radio sets and parts, scientific instruments, timber-measuring instruments and precision instruments.

Purchase is desired in Zurich, Switzerland (No. 14,937), of radio sets and parts.

Purchase is desired in Melbourne, Australia (No. 14,891), of telephone cable, and wire-armored, lead-sheathed cable.

Purchase and agency is desired in Dublin, Ireland (No. 14,938), for X-ray and electromedical apparatus.

Purchase and agency is desired in Port Louis, Mauritius (No. 14,849), for wire and wiring supplies, incandescent lamps, wiring accessories, etc.

An agency is desired in Alexandria, Egypt (No. 14,938), for wiring supplies and devices.

Purchase is desired in Shikarpur, India (No. 14,918), of ice-making machinery and refrigerator.

New Incorporations

THE DUNDEE (OHIO) LIGHT & POWER COMPANY has been incorporated with a capital stock of $3,000 by Ralph E. Banker and associates, to operate a local electric light plant.

THE POWER CORPORATION OF HARLEM VALLEY, Brewster, N. Y., has been incorporated by J. T. Taafe, Albany; Frank C. Agnew, Plattsburgh, and Charles F. Polk, Watervliet. The capitalization is placed at 1,000 shares of no par value.

THE HOME POWER & LIGHT COMPANY, Clarksdale, Miss., has been incorporated with a capital stock of $100,000 by W. A. Cox and J. A. Braders.

THE PELAHATCHIE (MISS.) POWER COMPANY has been chartered with a capital stock of $10,000 by E. N. Ross and L. O. Church.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

CHICOPEE, MASS.—Plans have been filed by the Turners Falls (Mass.) Power & Electric Company, for an addition to its substation on Grattan Street, to cost about $30,000.

WEYMOUTH, MASS.—The Edison Electric Illuminating Company, Boston, has applied for permission to erect 110-kv. transmission line from Weymouth to Bellingham on the border of Rhode Island, passing through Braintree, Randolph, Walpole and Medway, a distance of 31 miles. The cost is estimated at $1,740,000.

HARTFORD, CONN. — The New York New Haven & Hartford Railroad Company plans to build a new transformer station at Spruce and Church Streets.

Middle Atlantic States

BUFFALO, N. Y.—The Bethlehem (Pa.) Steel Corporation plans to equip another section of its Lackawanna Steel Works, for electrical operation in connection with extensions and improvements now under way.

GREAT VALLEY, N. Y. — The Olean (N. Y.) Electric Light & Power Company has applied to the Public Service Commission for permission to erect a distribution system in Great Valley and exercise a franchise granted by the town officials.

HERKIMER, N. Y.—The Municipal Commission of the village of Herkimer has applied to the Public Service Commission for permission to extend and operate a transmission line in different sections of the town of Herkimer to supply electricity from the municipal electric plant for street-lighting and domestic purposes.

HUMPHREY, N. Y.—The Olean (N. Y.) Electric Light & Power Company has applied to the Public Service Commission for approval of a franchise granted by the Town Board to extend its transmission lines to the town erection of distribution system in the town.

IRONDEQUOIT, N. Y.—Contract has been awarded by the Town Board to the Rochester (N. Y.) Gas & Electric Corporation for lighting 12 miles of streets, extending from Wisner Road to the outlet at Sea Breeze. The contract calls for 250 lamps of 200 cp. each.

NEW YORK, N. Y.—Plans have been approved for the electrification of the Yonkers branch of the Putnam division of the New York Central Railroad Company using a third-rail system, with power to be furnished from substations at Mott Haven, Glenwood and Marble Hill.

PHILLIPSTOWN, N. Y. — The Public Service Commission has granted the Phillipstown Electric Corporation permission to extend its system to and to exercise an electric franchise in the village of Cold Springs.

RANDOLPH, N. Y.—The Western New York Electric Company, Janestown, has petitioned the Public Service Commission for permission to extend its transmission and distribution lines to furnish electric service in the village and town of Randolph and the village of East Randolph and for approval of franchises granted by the town and village boards.

SCHENECTADY, N. Y.—Extensions are contemplated by the Adirondack Power & Light Corporation to provide electric service to 2,000 rural customers, over a total of 143 miles of circuits, radiating from thirteen central districts, throughout its territory between Lake George and Hudson Falls on the north and Schenectady. The above plans call for the erection of 64 miles of new line. The cost of the work is estimated at about $200,000.

WATERTOWN, N. Y.—The construction of a hydro-electric plant at Rock Dam on the East Branch of the Oswegatchie River, where there is a head of about 115 ft. is under consideration by the Northhern New York Utilities, Inc. The probable cost of the project is placed at $1,000,000.

HAWTHORNE, N. J.—An ordinance has been adopted by the Borough Council providing for the installation of a new fire-alarm system.

GROVE CITY, PA.—The installation of an ornamental lighting system on the East and West Washington Boulevards is under consideration by the City Council.

HAMPTON, PA.—Plans are under way by the Hanover (Pa.) Power Company to extend its transmission line to Hampton to furnish electric service there. Electricity will also be supplied to residences along the line.

READING, PA.—The Metropolitan Edison Company has applied to the Public Service Commission for permission to reconstruct its lines from Middletown to Steelton.

BELAIR, MD.—The Consolidated Gas, Electric Light & Power Company, Baltimore, which recently acquired the local plant, plans extensions in its transmission lines in this vicinity.

RICHMOND, VA.—The Montague Manufacturing Company will install electric power equipment in connection with the proposed rebuilding of its lumber and woodworking plant recently damaged by fire, with loss of about $250,000.

ROCKY MOUNT, VA.—Negotiations have been completed by the Appalachian Power Company, Bluefield, for the purchase of the local electric plant. Improvements, it is understood, are contemplated, including the installation of a new turbine.

WASHINGTON, D. C.—Bids will be received by the Bureau of Yard and Docks, Navy Department, Washington, until May 27, for motors, pumps, electric equipment, etc., for a water system (Specification 5054).

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, until May 21, for radio transmitters (Proposal C.P. 20950-1); until May 22, for 44,720 ft. paper-insulated telephone cable, 31,680 ft. paper-insulated cable, and twelve cable reels (Proposal C.P. 20725-1); until May 23, for 700 insulators (Proposal C.P. 21149-1).

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, Washington, until May 28 for motors, electric fixtures, head-set receivers, 1,500 ft. two-conductor power cable, 1,500 ft. telephone cable, 550 lb. magnet wire, etc. (Panama Circular 1668).

North Central States

BELLAIRE, MICH.—Plans are being prepared for the construction of a hydraulic power plant, wasteway and highway bridge for the village of Bellaire. Ayers, Lewis, Norris & May, Ann Arbor, are engineers.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of

Purchases and Supplies, City Hall, until May 22 for furnishing lead-sheathed cable for the Division of Water and Heat.

CLEVELAND, OHIO.—Plans have been filed by the Cleveland Electric Illuminating Company for an automatic substation, at 3531 East 142d Street, to cost about $57,000.

LIMA, OHIO. — A permit has been granted to the Ohio Power Company, Canton, for the erection of a 3,000-kw. substation at High and Collins Avenue, to cost about $30,375.

MOUNT STERLING, KY. — The City Council is negotiating with the Kentucky Utilities Company, Louisville, for the installation of an ornamental lighting system on Main Street.

ANGOLA, IND. — Extensions and improvements are contemplated by the Indiana Electric Utilities Company, including the erection of transmission lines connecting its systems with the lines of the Indiana Service Corporation at Fort Wayne and the Interstate Public Service Company at Goshen. About 35 miles of new line will be added to the Angelo territory. A new 33,000-volt line will be erected from Auburn to Fort Wayne, where it will connect with the system of the Indiana Service Corporation. This line will extend north from Auburn to Waterloo, to within 2½ miles of the Steuben-DeKalb county line. From there it will be extended to Helmar, thence to Wolcottville and from there to near Topeka, connecting there with the lines of the Interstate Public Service Company. The cost is estimated at about $160,000.

MICHIGAN CITY, IND.—Plans are being prepared by the Northern Indiana Gas & Electric Company, Hammond, for a local substation with initial capacity of about 15,000 kw. Work will soon begin on a 24-mile steel tower transmission line from Aetna, to the new local substation, to be built by the Calumet Power Company, Gary, and operated by the Northern Indiana company. The entire cost is estimated at $1,200,000.

GREAT LAKES, ILL.—Bids will be received by the Construction Division, Veterans Bureau, Washington, D. C., until May 26, for one electric passenger elevator and one freight elevator for the local institution.

BARRON, WIS.—Plans are under consideration by the City Council for the installation of an ornamental lighting system in business section and also placing electric wires in the district underground.

PITTSVILLE, WIS.—Plans are under way by the Badger Light & Power Company, Stevens Point, to extend its transmission line about 12 miles from Pittsville to serve the villages of Dexterville and Babcock, now without electrical service.

OWATONNA, MINN. — Bonds to the amount of $49,000, have been authorized for a municipal electric light and heating plant.

RED WING, MINN.—A site has been acquired by the Northern States Power Company, Chicago, for a proposed substation for the terminal of the third transmission line which will extend from Cannon Falls to this city. The proposed line will carry 66,000 volts and will cost about $170,000.

PROMISE CITY, IOWA. — The City Council is arranging a bond issue for the installation of a municipal electric lighting system.

KANSAS CITY, MO.—The Southwestern Milling Company, Board of Trade Building, plans to install electric power equipment in connection with extensions to its grain elevator to cost about $300,000. The A. E. Baxter Engineering Company, Ellicott Square, Buffalo, is engineer.

OZARK, MO. — Permission has been granted the W. K. Electric Company to erect a transmission line from Ozark to Nixa.

ST. LOUIS, MO.—Bids, it is understood, will soon be asked by J. E. Hooker, City Director, City Hall, for reinforced-concrete lamp standards, with glassware, wiring, etc., for various streets and parks, to cost about $40,000.

GRAND FORKS, N. D.—Work will soon begin on remodeling the power plant at the University of North Dakota, for which $24,650, has been appropriated.

SYKESTON, N. D.—The City Council is considering the construction of a transmission line from Carrington, for local service, and installation of a street-lighting system.

MURDO, S. D. — The Murdo Electric Company contemplates installing an additional generating unit driven by a 75-hp. or 100-hp. oil engine. L. Sleman is general manager.

BLOOMFIELD, NEB.—At an election to be held May 26 the proposal to issue $50,000 in bonds to install a municipal electric light and power plant will be submitted to the voters. The proposed plant would be located at the city park and operated in connection with the present waterworks station.

PENDER, NEB.—Bids will be received by the City Council until May 19 for the installation of an ornamental lighting system in the business section, about thirty-one single-lamp standards will be required.

WICHITA, KAN.—Plans are under way by the Kansas Gas & Electric Company for the erection of a 60,000-volt transmission line from Wichita to Arkansas City to cost about $250,000.

Southern States

MOUNT AIRY, N. C.—The City Council is considering extensions and improvements in the electric light and power system.

OAK CITY, N. C.—The City Council has issued $15,000 in bonds for the installation of a municipal lighting system.

GRAY COURT, S. C.—A franchise has been granted by the city to J. Archer Willis, Greenville, and associates, to furnish electricity here. Plans under way for the construction of a local power plant to supply the service.

JOHNSTON, S. C. — The Broad River Power Company, Columbia, has acquired the property of the Johnston Electric Light & Ice Company, also the electric system at Trenton, S. C., operated by B. J. Day, Jr., and the transmission system between the two towns. Extensions in transmission system are contemplated, including the installation of substation equipment.

YORK, S. C.—The Southern Public Utilities Company, Charlotte, N. C., contemplates extensions and improvements in the municipal light and power system, recently acquired.

BLACKSHEAR, GA.—The Ware County Light & Power Company, Waycross, which has been granted a franchise in Blackshear, plans to erect a transmission line from Waycross to Blackshear and install a substation here. The cost is estimated at $35,000.

ROME, GA.—Plans for the proposed local mills of the Brighton Mills, Inc., Passaic, N. J., to cost about $350,000, include a power house. J. E. Serrine & Company, Greenville, S. C., are architects and engineers.

SAVANNAH, GA.—The Atlantic Coast Railway Company, Wilmington, N. C., plans the installation of a floodlighting system at its local yards at Southover Junction, to cost about $20,000.

PALMETTO, FLA.—Tentative plans are under consideration by the City Council for the construction of a municipal electric plant.

ST. PETERSBURG, FLA. — Plans are being considered by the Board of Public Works for extensions and improvements in the street-lighting system, in the business district and other sections.

NASHVILLE, TENN. — Improvements are contemplated by the Nashville Railway & Light Company at its local central substation, to cost about $65,800.

PURYEAR, TENN. — W. C. Littleton, owner of the local electric plant, contemplates installing a battery system to give twenty-four-hour service.

BIRMINGHAM, ALA.—Bids, it is reported, are being received by the Alabama Power Company for three hydraulic turbine-driven generators, complete, of 45,000 hp. each, to be delivered within one year at the power development on the Tallapoosa River.

MOBILE, ALA.—Bids will be received by the Board of Commissioners until May 26 for the construction of a new central fire and signal station. A. H. Downey, 51 St. Joseph Street, is architect.

CHURCH POINT, LA.—Bids will be received by the Mayor and Board of Aldermen until May 19 for improvements to waterworks, including two crude-oil engines, one motor-driven fire pump, one motor-driven domestic service pump, one motor-driven air compressor, transformers, steel tank and tower, etc. Swanson-McGraw, Inc., United Fruit Building, New Orleans, is engineer.

CHURCH POINT, LA.—Bids will be received by the Church Point Light, Power & Ice Company, Inc., until May 20 for construction of an electric light and power plant, consisting of two alternators, poles and pole-line material, etc., street-lighting fixtures, transformers and ice plant complete. Swanson-McGraw, Inc., United Fruit Building, New Orleans, is engineer.

CHEROKEE, OKLA.—A special election will be held on May 19 to vote on the proposal to issue of $35,000 in bonds for extensions and improvements in the municipal electric plant, including new equipment.

ENID, OKLA.—The City Council, the ELECTRICAL WORLD is informed, does not contemplate calling a special election or installing a municipal lighting system as reported in the issue of May 2.

LEEDY, OKLA.—Bids will be received by J. D. Bonford, engineer, Elk City, until May 20 for the erection of 35 miles of 13,200-volt transmission line from Leedy to Elk City and the installation of a distribution system at Leedy. The cost is estimated at $25,000.

PONCA CITY, OKLA.—Bids will be received by C. E. Norton, city clerk, until May 28 for one Diesel oil engine of about 1,250 hp. and one 850-kw. generator, 2,300 volts, three-phase, 60 cycles.

DALLAS, TEX.—Plans are under way for the installation of ornamental lamps on Akard Street, between Commerce Street and Pacific Avenue, to cost about $20,000. The owners of the Adolphus Hotel and Andrews Building are at the head of the project.

FORT WORTH, TEX.—The installation of an ornamental lighting system on the Fort Worth Pike, extending to Dallas, about 32 miles, to cost about $65,000, is under consideration by the Board of Supervisors of Tarrant County. The local Chamber of Commerce is interested in the project.

Pacific and Mountain States

ALBANY, ORE.—The Mountain States Power Company is planning to erect an 11,000-volt transmission line to connect the electric systems in Sublimity and Aumsville, acquired some time ago by the company, with Stayton. Electricity for the town of Wheeler, where the company has acquired the municipal electric plant, will be served by the system of the Coast Power Company, Tillamook, also taken over by the Mountain States Company.

ANAHEIM, CAL.—Plans under way for extensions in the ornamental lighting system on Centre and Los Angeles Streets, for which bids will soon be asked.

BAKERSFIELD, CAL.—Plans are being prepared by the Southern California Edison Company, Los Angeles, for the erection of a 255-mile high-tension transmission line between Huntington Lake and Los Angeles, to cost about $2,500,000.

BERKELEY, CAL.—Bids have been rejected by the City Council for the proposed ornamental lighting systems in Durant Avenue and Bancroft Way. New bids will soon be asked. Frank B. Rae is electrical engineer for the city.

HAYWARD, CAL.—Plans are under way by the Pacific Gas & Electric Company, San Francisco, for the construction of a substation, to cost about $190,000, to serve a territory about 20 miles square. The equipment will consist of four transformers with a rating of 2,000 kva., one 1,000-kw. converter, one 400-kw. motor-generator, etc.

LODI, CAL.—Property owners in the Barnhart tract section have petitioned the City Trustees to authorize the formation of a lighting district. It is planned to install about 200 lamp standards maintained by an underground conduit system.

MERCED, CAL.—The Great Western Power Company, San Francisco, has petitioned for a franchise to erect a transmission line direct from Sacramento to Merced, where it will connect with the lines of the San Joaquin Light & Power Corporation, recently acquired.

RIVERSIDE, CAL.—Plans are being considered by the Southern Sierras Power Company to extend its transmission lines into the delta region of the Colorado River in Lower California to serve electricity to a number of irrigation wells, recently installed.

SALINAS, CAL.—Plans have been prepared by the Coast Valleys Gas & Electric Company for a substation at Carneros and Bridge Streets. It is proposed to build a garage, machine shop, storehouse and other buildings on an adjoining site later.

SAN DIEGO, CAL.—The Mission Beach Company plans to install an ornamental lighting system at Mission Beach, to cost about $50,000. H. A. Kuehmsted is chief engineer.

SAN FRANCISCO, CAL.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 26, for 1,000 dry batteries, for the Mare Island Navy Yard (Schedule 3714).

Electrical Patents

Announced by U. S. Patent Office

(Issued April 14, 1925)

1,533,415. ELECTRIC SOCKET; J. Hohl, Newark, N. J. App. filed March 27, 1923. Separable key socket.

1,533,422. WEB PICTURE-MESSAGE TRANSMISSION; C. F. Jenkins, Washington, D. C. App. filed Feb. 16, 1924.

1,533,452. ELECTRICAL SEAL; P. H. Paulen, Cleveland, Ohio. App. filed Nov. 18, 1922.

1,533,477. ROUTINE TEST CIRCUITS FOR CENTRAL-OFFICE SENDERS; F. A. Stearn, Paterson, N. J. App. filed Sept. 23, 1922. Of telephone system.

1,533,498. FUSE; J. H. Hickey, San Francisco, Cal. App. filed July 11, 1923.

1,533,502. METHOD OF AND MEANS FOR ADJUSTING ROTARY SPARK GAPS OF WIRELESS APPARATUS; J. L. Jenks, Jr., Medford, Mass. App. filed Feb. 11, 1922.

1,533,515. SIGNALING SYSTEM; DeE. A. Reynolds, Yonkers, N. Y. App. filed Feb. 3, 1921. Police call system.

1,533,541. ELECTRIC LIQUID-HEATING APPARATUS; J. H. Derby, New York, N. Y. App. filed Jan. 11, 1922.

1,533,542. SIGNAL TRANSMITTER; J. H. Derby, New York, N. Y. App. filed June 17, 1922. For fire-alarm systems.

1,533,562. ELECTRIC SWITCH ACTUATING MECHANISM; H. P. McColl, Melbourne, Victoria, Australia. App. filed Aug. 21, 1922. For pull-cord electric switch.

1,533,568. NEGATIVE ELECTRODE FOR ELECTRIC ACCUMULATORS; A. Pouchain, Turin, Italy. App. filed March 24, 1921.

1,533,569. ELECTRIC ACCUMULATOR; A. Pouchain, Turin, Italy. App. filed Sept. 25, 1922.

1,533,623. TRANSMISSION OF ELECTRIC ENERGY; G. Viel, St. Etienne, France. App. filed Jan. 18, 1921.

1,533,645. SUBMARINE SIGNALING SYSTEM; J. J. Gilbert, Port Washington, N. Y. App. filed May 31, 1922.

1,533,647. ELECTRIC DRIVE FOR PHONOGRAPHS; C. I. Hall, Fort Wayne, Ind. App. filed May 18, 1923.

1,533,653. MODULATION; W. A. MacDonald, Hartsdale, N. Y. App. filed Nov. 12, 1920. Of carrier-frequency electrical oscillations in a wave-signaling system.

1,533,655. SEGREGATED DRIVE FOR PAPER MACHINES AND THE LIKE; W. L. Merrill, Schenectady, N. Y. App. filed Feb. 9, 1920.

1,533,675. MICROPHONE; A. Thomas, Paris, France. App. filed Aug. 11. 1920.

1,533,677. MOTOR-OPERATED TIME SWITCH; H. E. Warren, Ashland, Mass. App. filed Oct. 25, 1921.

1,533,678. ELECTRIC CLOCK SYSTEM; H. E. Warren, Ashland, Mass. App. filed Sept. 27, 1922.

1,533,690. ELECTRIC RECEPTACLE; T. A. Both, Stratford, Conn. App. filed April 24, 1920.

1,533,691. SOCKET SHELL OR CASING; T. A. Both, Stratford, Conn. App. filed July 29, 1920.

1,533,693. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; E. C. Britton, Schenectady, N. Y. App. filed May 2, 1924.

1,533,699. ELECTRICAL SWITCH MECHANISM; A. C. Day, Melbourne, Australia. App. filed Feb. 14, 1923. Primary switch in series with a subsidiary circuit having any required switch, so then when opened the subsidiary circuit automatically comes into operation.

1,533,714. MULTIPLE FUSE PLUG; W. H. Taylor, C. W. Downs and J. W. Barbey, Detroit, Mich. App. filed May 6, 1922.

1,533,729. TYPEWRITING TELEGRAPH; E. Ehrhardt, Hermsdorf, near Berlin, Germany. App. filed Oct. 26, 1920.

1,533,730. TELEPHONE TRANSMITTER; R. A. Engler, New York, N. Y. App. filed Sept. 2, 1919.

1,533,741. METALLURGICAL PROCESS; F. O. Kichline and H. W. Sloyer, Lebanon, Pa. App. filed June 13, 1924. For recovering copper and other metals from solutions.

1,533,757. APPARATUS FOR CHANGING ELECTRICAL VARIATIONS TO MECHANICAL; K. Rahbek and F. A. Johnsen, Copenhagen, Denmark. App. filed March 10, 1919.

1,533,758. HUMIDOR; C. Reynolds, Nashville, Tenn. App. filed May 3, 1924.

1,533,759. JUNCTION BOX; H. F. Richardson, Brooklyn, N. Y. and A. Coggeshall, Pleasantville, N. Y. App. filed July 12, 1924. Interior electric wire conduits.

1,533,770. AUTOMATIC CIRCUIT MAKER AND BREAKER; H. N. Shaw, Milwaukee, Wis. App. filed May 8, 1922. For maintaining the temperature of heating devices.

1,533,771. SOCKET PLUG; H. E. Slade, Newark, N. J. App. filed Oct. 12, 1923.

1,533,797. INDUCTION COIL; V. Greiff, New York, N. Y. App. filed June 4, 1921.

1,533,808. LIGHTING FIXTURE; J. E. Pridmore, Chicago, Ill., and E. C. McKinnie, Oak Park, Ill. App. filed May 6, 1922. Crystal chandelier type.

1,533,842. TELEPHONE AND TELEGRAPH SYSTEM WITH AMPLIFIERS; H. Fassbender, Charlottenburg, Germany, and E. Habann, Berlin, Germany. App. filed May 3, 1921.

1,533,845. HEATER; J. S. Forbes, Overbrook, Pa. App. filed May 3, 1923. For small rooms.

1,533,858. METHOD AND MEANS FOR NEUTRALIZING CAPACITY COUPLING IN AUDIONS; L. A. Hazeltine, Hoboken, N. J. App. filed Dec. 28, 1920.

1,533,874. ELECTRIC ARC WELDING AND PREHEATING HANDLE; H. W. Livermore, East Orange, N. J. App. filed Dec. 30, 1921.

1,533,900. MERCURY AND OTHER VAPOR ELECTRIC LAMP; F. Reynolds, Walkerville-on-Tyne, England. App. filed April 16, 1924.

1,533,936. SURFACE WIRING FOR ELECTRICITY DISTRIBUTING SYSTEMS; T. H. Martin-Harvey, Bickley, England. App. filed March 28, 1923.

1,533,959. ELECTRIC SOLDERING DEVICE; E. Wagner, Loveland, Col. App. filed Oct. 31, 1922.

1,533,972. CIRCUIT-BREAKING TERMINAL; G. H. Clark, Brooklyn, N. Y. App. filed Feb. 15, 1924. For low-voltage circuits as a battery circuit.

(Issued April 21, 1925)

1,534,026. CHARGING SECONDARY BATTERIES; E. L. Burne, Westminster, London, England. App. filed Feb. 10, 1923.

1,534,031. ELECTROLYTIC PRODUCTION OF ALUMINUM; F. C. Frary, Oakmont, Pa. App. filed April 10, 1924.

1,534,034. APPARATUS FOR ELECTRICALLY WELDING WIRE FABRIC; W. S. Southwick, Clinton, Mass. App. filed Dec. 10, 1921.

1,534,042. ELECTRICALLY HEATED TRAVELING OVENS; R. G. Tugendhat, Saginaw, Mich. App. filed Aug. 1, 1924.

1,534,069, 1,534,070. PERCUSSIVE WELDING MACHINE; A. M. MacFarland, Wilkinsburg, Pa. App. filed July 6, 1923.

1,534,073. MEANS FOR NEUTRALIZING FOREIGN INTERFERENCE; H. Nyquist, Elmhurst, N. Y. App. filed May 19, 1922. In grounded telegraph circuits.

1,534,074. TELEGRAPHY; R. D. Parker, Brooklyn, N. Y. App. filed May 20, 1920. "Single" telegraph systems.

1,534,079. ELECTRIC STEAM GENERATOR; A. N. Russell, B. A. Malkin and W. P. Muir, Lachine, Quebec, Canada. App. filed May 2, 1922.

1,534,086. TRANSFORMER CIRCUITS; E. O. Scriven, New York, N. Y. App. filed Aug. 8, 1922. For radio system.

1,534,109. AUTOMATIC TELEPHONE SWITCH; H. W. Goff, New York, N. Y. App. filed July 12, 1922.

1,534,118. METHOD OF ADJUSTING BALANCE BETWEEN ELECTRICAL CONDUCTORS OR NETWORKS; H. W. Hitchcock, Berkeley, Cal. App. filed Dec. 16, 1922.

1,534,122. ELECTRIC RIVET HEATER; W. S. Johnson and J. W. Sheffer, Berwick, Pa. App. filed Feb. 28, 1921.

1,534,133. WELDING; T. E. Murray, Jr., Brooklyn, N. Y. App. filed Aug. 22, 1922. Process for welding the edges of tubular and similar products.

1,534,144. AUTOMATIC SUBSTATION TELEPHONE CIRCUIT; A. B. Smith, Evanston, Ill. App. filed June 7, 1922.

1,534,148. SOUND TRANSLATING APPARATUS; H. Vogt, Berlin-Schoneberg, Germany, and J. Engl and J. Massolle, Grunewald, Germany. App. filed April 4, 1921.

1,534,162. ELECTRIC FURNACE; O. Coradi, Zurich, Switzerland. App. filed Jan. 10, 1923. Resistance type.

1,534,164. PRINTING APPARATUS SUITABLE FOR PRINTING TELEGRAPHIC MESSAGES; F. G. Creed, Croydon, England. App. filed Aug. 7, 1920.

1,534,172. AMPLIFIER CIRCUITS; F. E. Field, Somerville, N. J. App. filed Dec. 1, 1922. Having means for adjustment in the input circuit.

1,534,205. ELIMINATING DISTURBING ENERGY; R. A. Fessenden, Brookline, Mass. App. filed Aug. 20, 1917. In submarine signaling and detecting submarines.

1,534,221. ELECTRIC FLOOR HEATER; A. J. Kercher, Berkeley, Cal., and W. W. Hicks, San Francisco, Cal. App. filed March 10, 1924.

1,534,251. ELECTRIC LIGHT; C. G. Smith, Cambridge, Mass. App. filed Jan. 28, 1918. Illumination is secured by the passage of a current through a gas.

1,534,282. ELECTRIC MOTOR; G. F. Packard, Wilkinsburg, Pa. App. filed Oct. 20, 1920. Induction type.

1,534,287. METHOD OF AND MEANS FOR ELECTRIC ENERGY TRANSLATION; J. C. Schelleng, East Orange, N. J. App. filed Dec. 21, 1923.

1,534,288. GRID RESISTANCE PANEL FOR ELECTRIC WELDING APPARATUS; A. Smith, San Mateo, Cal. App. filed June 14, 1921.

1,534,291. ELEVATOR SAFETY APPLIANCE; D. A. MacAskill, Brooklyn, N. Y. App. filed Jan. 9, 1924. For gripping the safety control cable.

1,534,298. WATER-HEATING DEVICE; W. F. Clark, Cleveland, Ohio. App. filed July 14, 1921. Instantaneous type.

1,534,315. ELECTROLYTICALLY REFINED ALUMINUM AND ARTICLES MADE THEREFROM; W. Hoopes, Pittsburgh, Pa. App. filed Dec. 21, 1922.

1,534,316. PRODUCTION OF METALLIC ALUMINUM FROM IMPURE MATERIALS; W. Hoopes, Pittsburgh, Pa., and F. C. Frary and J. D. Edwards, Oakmont, Pa. App. filed Dec. 21, 1922.

1,534,317. ELECTROLYTIC PRODUCTION OF ALUMINUM; W. Hoopes, Pittsburgh, Pa. and F. C. Frary and J. D. Edwards, Oakmont, Pa. App. filed Dec. 21, 1922.

1,534,318. ELECTROLYTIC REFINING OF ALUMINUM; W. Hoopes, Pittsburgh, Pa., and F. C. Frary and J. D. Edwards, Oakmont, Pa. App. filed Dec. 21, 1922.

1,534,319. REFINING ALUMINUM ELECTROLYTICALLY WITH FUSED ELECTROLYTES; W. Hoopes, Pittsburgh, and F. C. Frary, Oakmont, Pa. App. filed Dec. 21, 1922.

1,534,320. CELL FOR ELECTROLYTIC REFINING OR SEPARATING PROCESS; W. Hoopes, Pittsburgh, Pa. App. filed Dec. 21, 1922.

1,534,321. METHOD OF LINING CELLS FOR ELECTROLYTIC REFINING; W. Hoopes, Pittsburgh, Pa. App. filed Dec. 21, 1922.

1,534,322. ELECTROLYTIC CELL AND METHOD OF LINING THE SAME; W. Hoopes, Pittsburgh, Pa., and J. D. Edwards, Oakmont, Pa. App. filed Dec. 21, 1922.

1,534,335. SYSTEM OF ELECTRIC CURRENT DISTRIBUTION; C. A. Turner, Chicago, Ill. App. filed Sept. 25, 1922. For supplying current to translating devices at low voltage from circuits at high voltage.

1,534,363. BURGLAR ALARM; J. H. Day, Des Moines, Ia. App. filed April 19, 1921.

1,534,379. CONTACT BREAKER; A. Gilberts, Chicago, Ill. App. filed Aug. 24, 1921. Make-and-break device for electric bells, buzzers, etc.

1,534,388. ELECTRICALLY HEATED HUMIDIFYING APPARATUS; O. D. Hogue, Brookline, Mass. App. filed May 9, 1922.

1,534,422. HOLDING FIXTURE FOR ELECTRIC WELDING OF SIDE SEAMS OF CONTAINER BODIES; W. A. Smith, Geneva, Ill., and M. E. Widell, Maywood, Ill. App. filed Feb. 28, 1921.

1,534,430, 1,534,431. ELECTRIC WAFFLE IRON; G. F. Wells, San Francisco, Cal. App. filed May 10, 1924.

1,534,444. MASSAGE INSTRUMENT; A. Feldheym, San Francisco, Cal. App. filed July 25, 1923.

1,534,457. ELECTRODE CLAMPING DEVICE FOR ELECTRIC WELDING MACHINES; J. W. Meadowcroft, Philadelphia, Pa. App. filed Aug. 16, 1921.

1,534,515. ELECTRIC SWITCH CONSTRUCTION; B. E. Getchell, Plainville, Conn. App. filed Sept. 18, 1922. Safety type.

1,534,516. SAFETY SWITCH; B. E. Getchell, Plainville, Conn. App. filed Oct. 31, 1922.

1,534,542. ELECTRICALLY HEATED SADIRON; A. E. Reimers, New York, N. Y. App. filed Oct. 11, 1920. May be heated to different degrees of temperature, and certain parts of the iron may be heated to a higher temperature than other parts.

1,534,549. SWITCH CONTROL CIRCUIT FOR AUTOMATIC TELEPHONE SYSTEMS; A. B. Smith, Evanston, Ill. App. filed Sept. 19, 1919.

1,534,553. ELECTRIC HEATING UNIT; F. von Schlegell, Chicago, Ill. App. filed Sept. 13, 1920. Applicable to melting or annealing furnaces, electric welding, etc.

1,534,571. ELECTRIC HEATER; J. Conning, Chicago, Ill. App. filed Oct. 1, 1924.

1,534,589. ELECTRIC DOORKNOB ALARM; E. S. Hausser, Joliet, Ill. App. filed Aug. 29, 1922.

1,534,592. DENTAL OVEN; H. C. Houck, Seattle, Wash. App. filed Dec. 24, 1923.

1,534,624. ELECTRIC PERFUMER; L. Weidlich, Stratford, Conn. App. filed June 27, 1924.

1,534,640. ELECTRIC OUTLET FIXTURE; W. B. Goddard, San Francisco, Cal. App. filed Nov. 25, 1921.

1,534,656. BATTERY CELL; R. S. Owens, Brooklyn, N. Y. App. filed May 16, 1924. Dry-battery cell.

1,534,660, 1,534,661. SYSTEM OF TELEGRAPHIC DISTRIBUTION; L. M. Potts, Baltimore, Md. App. filed April 7, 1920.

1,534,662. LIGHTING FIXTURE; J. K. Riddle, Toledo, Ohio. App. filed Oct. 28, 1924.

1,534,673. ELECTRICAL HEATING ELEMENT; W. W. Weir, Alameda, Cal. App. filed Jan. 10, 1923. For electric stove.

Financial and Corporate

Utility Prices Step Up

Smart Advances Made by Issues of Most Groups in Bullish Market

IT WOULD scarcely be accurate to say that the bullish market for stocks in general during the week under review carried in its trail a bullish market for public utility stocks, for the fact is that utility stocks were really stronger than almost any other group. The revival of interest in utilities of late has brought a market that resembles in many respects the big markets of a year ago. While the utility situation remains sound and unusual developments are adding values to stocks in many quarters, the advances in other quarters have been highly speculative. Unquestionably the ease in money rates has, as it has in the case of railroad and industrial stocks, played an important part in the buying movement.

It would be difficult to single out a few stocks as typical of the movement, for the accumulation has spread over virtually all of the leading groups. Perhaps the spectacular advance in Carolina Power & Light to a position forty points above where it was a week ago was the outstanding development of the week, but it was not typical. Adirondack Power & Light improved its position by seventeen and one-half points during the week on the prospect for favorable consideration for the stock in the new deal that is being negotiated. American Light & Traction advanced fifteen points and Buffalo General Electric about sixteen points.

The shares of the Commonwealth Power Corporation resumed their upward course, establishing a new recent high well above 133 in adding about ten points to their position of the week before. Among the listed shares American Water Works & Electric got to new high ground at 56, which is the equivalent of 280 for the old stock that sold as low as 40 last year.

New Capital Issues

The largest piece of electric light and power financing during the past week was the five-million-dollar issue of 7 per cent cumulative prior preference stock of the Standard Gas & Electric Company offered at par, proceeds to be used for investment in public utility companies. Another sizable offering was the four-million-dollar issue of 7 per cent cumulative preferred stock of the Utilities Power & Light Corporation at $99 per share and accrued dividend. Twenty-five-year first mortgage gold bonds amounting to $4,200,000 were offered investors by the Western Public Service Company at 98 and interest to yield 6.15 per cent.

Two offerings were made by the Community Power & Light Company, one in the form of first mortgage collateral sinking-fund gold bonds totaling $1,750,000 and the other in the form of 7 per cent cumulative first preferred stock amounting to $750,000. With the funds derived from the sale of these securities the company will finance the acquisition of control of a group of valuable properties in the Texas Panhandle.

Also represented were the National Electric Power Company, with a million-and-a-half-dollar issue of 7 per cent cumulative preferred stock priced at 95 and accrued dividend to yield over 7.35 per cent, and the Indiana Power Company, with a million-dollar issue of three-year gold notes, priced at 99 and interest, yielding over 5¾ per cent.

Dividends Declared

The quarterly dividends listed in the following table were announced recently by electric light and power companies:

Name of Company	Per Cent	When Payable
Associated Gas & Elec., 6% cum. pf.	$1.50	June 1
American Power & Light, com.	.25	June 1
American Power & Light, com. *	....	June 1
Central Illinois Public Service, pf.	$1.50	July 15
Federal Light & Traction, com.	.20	July 1
Federal Light & Traction, com. (ex.).	.15†	July 1
Federal Light & Traction, pf.	$1.50	June 1
Northern States Pwr. of Wis., pf.	1¾	June 1
Oklahoma Gas & Electric, pf.	1½	June 15
Southern Colorado Power, pf.	1¾	June 15
Southwestern Power & Light, pf.	1½	June 1
Standard Gas & Elec., cum. pf.	2	June 15
White, J. G., & Co., pf.	1¾	June 1
Wisconsin Pwr. & Lt., pf., capital	$1.75	June 15

* One-fiftieth share of common stock.
† In common stock.

Company Reports

The following reports were recently issued by electric light and power companies for the month of March:

Name of Company	Gross Earnings for March 1925	1924
American Power & Light	$4,117,315	$3,790,921
American Water Wks. & Elec.	3,419,162	3,276,923
Asheville Power & Light	87,158	80,830
Binghamton Lt., Ht. & Pwr.	132,389	117,127
Blackstone Valley Gas & Elec.	403,532	364,841
Carolina Power & Light	261,572	206,531
Cent. Miss. Valley Elec. Prop.	48,176	48,557
Columbus Electric & Power	217,798	201,201
Eastern Texas Electric	191,355	176,432
Edison El. Illg. Co. of Brockton	142,735	128,481
El Paso Electric	204,331	204,162
Florida Public Service	83,091	71,125
Fort Worth Power & Light	226,220	268,153
Galveston-Houston Electric	327,414	288,150
Idaho Power	192,927	194,566
Kansas Gas & Electric	543,361	511,307
Lowell Electric Light	136,662	131,107
Metropolitan Edison	693,153	657,378
Mississippi River Power	291,750	285,370
Nebraska Power	329,125	328,237
New Jersey Power & Light	95,244	84,614
North Carolina Puolic Service	149,505	118,830
Northern Texas Electric	224,936	253,697
Pacific Power & Light	263,705	241,377
Pennsylvania Edison	233,500	252,754
Puget Sound Power & Light	1,045,562	1,056,828
Savannah Electric & Power	156,198	161,838
Southern California Edison	1,821,961	1,780,649
Southern Canada Power	95,320	88,124
Southwestern Power & Light	1,030,853	1,048,782
Tampa Electric	254,863	198,717
Texas Power & Light	521,673	552,520
Utah Power & Light	809,341	772,580
West Penn	2,255,763	2,252,902
Winnipeg Electric	474,448	456,634
Yadkin River Power	180,341	135,152

New York Utilities Merger Approved

Formal approval of the merger of four western New York power companies was voted this week at simultaneous meetings of the directors, and application for permission to carry out the plan was made to the New York Public Service Commission. The four organizations involved are the Buffalo General Electric Company, the Niagara Falls Power Company, the Niagara, Lockport & Ontario Power Company and the Tonawanda Power Company. Under the agreement the merger will be accomplished by the exchange of the individual company stocks for the stock of a holding company to be known as the Buffalo, Niagara & Eastern Power Corporation. This new corporation will acquire entire control, while the companies involved will retain their charter identities as operating subsidiaries.

It was also announced during the week that five other utilities—the Utica Gas & Electric, Cohoes Power & Light, Municipal Gas Company of Albany, Troy Gas and the Fulton County Gas & Electric—will be consolidated in a new corporation to be called the Mohawk & Hudson Power Corporation. Because the General Electric Company is a party to both mergers it is expected eventually there will be a grouping of these properties.

Cost of Financing Utilities

An analysis of the cost of financing new securities issued by a management group of operating companies with aggregate yearly gross earnings of about fifty-two million dollars shows that the average cost of money to the syndicate was about 6¼ per cent in 1924. The managing organization issued bonds totaling $46,181,300 in the five years from 1920 to 1924 inclusive, notes

COST AND YIELD OF SECURITIES OF ONE CENTRAL-STATION MANAGEMENT GROUP

	Bonds	Notes	Preferred Stocks
Number of issues 1920—24 inclusive	11	11	5
Amount	$46,181,300	$15,950,000	$8,825,700
Range in terms, years	1> to 34¼	1 to 15	.....
Range in rates, per cent	5 to 7¼	5 to 7	All 7
Average cost to company, per cent	6.62	7.86	7.23
Average cost to company for year 1924 issues	6.02	6.03	7.10
Average yield to investor	6.15	6.65	6.84
Average yield to investor for year 1924 issues	5.67	5.16	6.75

Range of costs to company was 5.55 to 8.38 per cent for the above bonds, 6 to 9.85 per cent for the notes and 7 to 7.74 per cent for the preferred stocks.

Range of yields to the investor was 5.13 to 7.75 per cent for the bonds, 5 to 8 per cent for the notes and 6.65 to 7.25 per cent for the preferred stocks.

amounting to $15,950,000 and preferred stocks totaling $8,825,700 during the period.

These securities, which totaled over seventy millions, were marketed in eleven bond, eleven note and five preferred stock issues. A summary of the cost and yield percentages of these twenty-seven issues is given in the accompanying table.

Southeastern Is Spreading Its Wings

New Holding Company Which Controls Alabama Power Company Has Annexed Numerous Properties Within the Last Six Months

BY PAUL WILLARD GARRETT

THE Southeastern Power & Light Company was organized less than a year ago as a Maine corporation to take over the assets of the former Canadian holding company, the Alabama Traction, Light & Power Company. At first it was supposed that the Southeastern, like its predecessor, would confine its activities to the principal subsidiary, the Alabama Power Company. In the last six months, however, it has become apparent that the Southeastern gradually is spreading its influence over the whole region from which it derives its name.

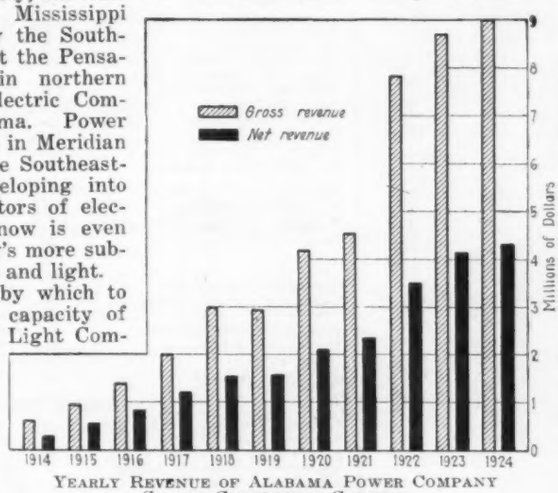
Numerous properties have been acquired or arranged for in southern Alabama, Florida and Mississippi, and the present plan calls for the formation of two new subsidiaries—namely, the Gulf Power Company and the Mississippi Power Company. Recently the Southeastern has added to its list the Pensacola Electric Company, in northern Florida, and the Mobile Electric Company, in southern Alabama. Power plants have been purchased in Meridian and Hattiesburg, Miss. The Southeastern little by little is developing into one of the largest distributors of electricity in the South and now is even grouped among the country's more substantial producers of power and light.

There is no way as yet by which to learn the present earning capacity of the Southeastern Power & Light Company, no statement having been published since the new holding company began to expand. This much at least can be said, that for the year ended August 31, 1924, the latest period for which figures are available, consolidated gross earnings totaled $9,541,246. No official statements have been made as to how much the additions and the growth of the organization will swell the 1925 gross, but it would not tell the whole story to say that this figure will be bettered by a half.

The accompanying chart is inadequate in that it covers only the Alabama Power Company, but the growth is nevertheless significant. Alabama Power's gross earnings thus increased persistently from $619,814 in 1914 to $8,995,820 in 1924, and net earnings in the same period grew from $307,465 to $4,325,183.

For a long period of years the management of the Alabama Power Company has resisted the temptation to pay dividends in the belief that the best interests of the stockholders would be better served by plowing all surplus funds back into the property. The belief obviously has been tested, and in recent months few utility stocks have undergone such a substantial appreciation. Southeastern recently sold as high as 76 as compared with a price of 30 for the old Alabama Traction Light & Power stock in 1924. The latter shares were exchanged for Southeastern on the basis of two to one, which is to say that the old stock has risen in a relatively short time from 30 to the equivalent of 152. While the Southeastern management has not yet declared dividends on the common stock, the expectation is that an initial payment will be made this year.

The Southeastern company is in a section of the country that is growing rapidly and, fortunately, is so situated that it can handle a large volume of additional business. It controls vast water resources that can be and in fact are being developed exclusive of Muscle Shoals. It forms a part of the superpower system of the South, included in which are also the Columbus (Ga.) Electric & Power Company and the Georgia Railway & Power Company, and these in turn are connected with all of the major systems in Georgia, Tennessee, North and South Carolina.



YEARLY REVENUE OF ALABAMA POWER COMPANY SHOWS CONSISTENT GROWTH

Associated Gas & Electric Offers Conversion Terms.—Holders of the 6½ per cent bonds, series 1924, of the Associated Gas & Electric Company have the privilege of exchanging $500,000 principal amount of these securities for the class A stock on the basis of thirty-six shares for each thousand-dollar bond and the same amount of these bonds for original shares of preferred stock on the basis of twenty shares for each thousand-dollar bond.

Allis-Chalmers Quarterly Statement.—The Allis-Chalmers Manufacturing Company reports billing for the first quarter of 1925 amounting to $7,130,952, an increase of $311,622 over the first quarter of 1924, and net profit of $847,053, an increase of $15,872 over the first quarter of the previous year. The unfilled orders on hand as of March 31, 1925, amount to approximately $10,146,675. Deducting $288,702 for the quarter's dividend on the preferred stock leaves a balance of $558,350 for the common, which is equivalent to $2.17 per share compared with $2.10 per share in the first quarter of 1924. The bookings for the current quarter aggregated $7,153,599, compared with $5,695,354 for same period a year ago, an increase of $1,458,244, or about 26 per cent.

Canadian G. E. Annual Report.—The annual report of the Canadian General Electric Company, Ltd., for the year 1924 shows an operating profit of $1,593,631, an increase of $111,397 over that for the year 1923, while the net profit after depreciation and interest amounted to $578,473, a decrease of $99,609. The decrease in net is due to increased depreciation written off in 1924 amounting to $600,000, as against $400,000 in 1923. Current assets and investments amount to $10,399,782 and current liabilities to $2,948,856, a ratio of 353 per cent.

Middle West Utilities Offers Stockholders Additional Stock.—At a recent meeting of the board of directors of the Middle West Utilities Company a dividend of $1.25 per share was declared on the common stock, payable May 15 to stockholders of record at the close of business on May 2. This action puts the common stock of the company on a 5 per cent dividend basis. At the same meeting it was decided to offer for subscription to all stockholders of record at the close of business May 15, whether holders of prior lien, preferred or common stock, new and additional shares of common stock equal to 10 per cent of their then holdings of existing stock of all classes. The subscription price will be $72.50 per share (practically a 7 per cent basis).

Securities Called for Payment in May.—Three issues of bonds of the Jersey Central Light & Power Company have been called for payment in May in advance of maturity—6½'s of 1926 amounting to $4,250,000, 6½'s of 1948 amounting to $4,000,000 and the 7's of 1933 amounting to $1,160,000. Among the other light and power securities to be paid off during the current month are the following: Niagara, Lockport & Ontario Power Company 5's of 1954, totaling $2,946,000; California Oregon Power 7's of 1944, totaling $1,500,000; 8 per cent notes of the Indiana Power Company, totaling $432,500; 6½ per cent bonds of the United Power & Light Company of Kansas, maturing in 1926, totaling $250,000; 7½'s, class B, of the American Public Service Company amounting to $233,100; Mid-West Power, class A, 8's, of 1941, totaling $138,250; Denver Gas & Electric 5's of 1949, totaling $88,700, and the National Light, Heat & Power 5's of 1935, totaling $58,000.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.)

Companies	Bid Price Saturday, May 9	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	100	98	102
Appalachian Power, 7 per cent	97½	92	100
Arkansas Light & Power 7 per cent	93½	92	98
Asheville Power & Light 7 per cent	a 99	99	100
Central Illinois Public Service 6 per cent	90	84	93
Colorado Power 7 per cent	94	93	98
Connecticut Light & Power 7 per cent	106	105	110
Consumers' Power 6 per cent	91½	90	93½
Dayton Power & Light 6 per cent	93	88	100
Duquesne Light 7 per cent	a108½	105	108½
Eastern Texas Electric 6 per cent	100	100	105
Empire District Electric 6 per cent	78	78	85
Fort Worth Power & Light 7 per cent	a101	100	102
Great Western Power 7 per cent	98	...	...
Illinois Northern Utilities 6 per cent	88	82	92
Illinois Power & Light 7 per cent	94	92½	98
Kansas Gas & Electric 7 per cent	a 99	99	99½
Long Island Lighting 7 per cent	101	100	105
Minnesota Power & Light 7 per cent	a 98	97	98½
Mississippi River Power 6 per cent	90	87½	92
Nebraska Power 7 per cent	a100	99	101
Niagara Falls Power 7 per cent—25	28½	28	29
Niagara, Lockport & Ont. Power 7 per cent	105½	101½	110
Northern States Power 7 per cent	96	95	100
Ohio Public Service 7 per cent	97	97	100
Pacific Gas & Electric 6 per cent	95	92	97
Pacific Power & Light 7 per cent	a 99	99	100
Penn-Ohio Power & Light 7 per cent	54	91	100
Pennsylvania Power & Light $7—no par	a101	100	101½
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	38½	37¼	45
Southern California Edison 8 per cent	120	115	122
Tennessee Electric Power, 6 per cent	81	80	84
Texas Power & Light 7 per cent	99½	99½	101
Utah Power & Light 7 per cent	a 99½	99½	100½
Western States Gas & Electric 7 per cent	89	82	89
Yadkin River Power, 7 per cent	a 99	98	100
Holding Companies			
American Gas & Electric 6 per cent—no par	86	85	89
American Light & Traction	97	93	97
American Power & Light 6 per cent	88	84	90
American Public Service 7 per cent	91	88	94
American Public Utilities 7 per cent	88	87	95
American Water Works & Electric 7 per cent	a102	95½	103¾
Associated Gas & Electric 7 per cent—1 per cent extra—no par	a 52	...	...
Associated Gas & Electric—$6—no par	84	...	...
Carolina Power & Light 7 per cent	103½	100	105
Central Indiana Power 7 per cent	89	88	95
Cities Service 6 per cent	81	80	83
Commonwealth Power 6 per cent	81½	80	82½
Consolidated Gas 6 per cent—50	59½	58½	59½
Continental Gas & Electric 7 per cent pr. pf.	90	89	95
Electric Bond & Share 6 per cent	a102	102	103½
General Gas & Electric—$8—no par	109	104½	111
*Middle West Utilities 7 per cent	97	91½	98½
National Power & Light—$7—no par	98	95	99
North American 6 per cent—50	a 49	46½	49
Public Service Corp. of N. J. 7 per cent	101½	96½	101½
Public Service Corp. of N. J. 8 per cent	a111	109	112½
Standard Gas & Electric 8 per cent—50	a 52½	50½	53¾
†United Gas Improvement—50	58	56½	58½
United Light & Power—$6.50—no par	83½	83	88
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	58	31	62
Appalachian Power—no par	77	70	83
Arkansas Light & Power	75	65	85
Brooklyn Edison	a133	120½	133
Buffalo General Electric—no par (new)	58	44	58
*Commonwealth Edison	a134½	130½	139
§Consolidated Gas, Electric Light & Power	38	32	38
Dayton Power & Light	420	180	460
Detroit Edison	a117½	110	119
|| Edison Electric Illuminating of Boston	204½	163½	204½
Long Island Lighting (new)	80	60	85
Mississippi River Power	41	37	42
Montana Power	a 83½	64	86½
Niagara Falls Power—no par	57½	45½	58
Niagara, Lockport & Ontario Power—no par	64	60	73
Northern Ohio Power	12	5	12
Northern States Power	110	103	113
North Texas Electric	60	60	70
Pacific Gas & Electric	109½	102½	109½
‡Penn Central Light & Power—no par	62	60	64½
§Pennsylvania Water & Power	143	126½	143½
‡Philadelphia Electric—25	38½	37½	47½
Public Service Co. of Northern Illinois	114	97	116
Puget Sound Power & Light	49	49	58
Southern California Edison	107	102	107½
Tennessee Electric Power—no par	58	47	61
Virginia Power	65	65	92
Virginia Railway & Power	a114½	64½	114½
West Penn. Co.	a122½	105	125

Companies	Bid Price Saturday, May 9	Low 1925	High 1925
Holding Companies			
American Gas & Electric—no par	82	70	82
American Light & Traction	158	139	158
American Power & Light	64	52	67
American Public Utilities	74	70	85
American Water Works & Electric	a 56½	34½	56½
Associated Gas & Electric, Class A	a 28½	...	...
Carolina Power & Light—no par	380	290	380
Cities Service (new)	37	34	43
Columbia Gas & Electric—no par	a 64½	45½	66½
Commonwealth Power Corp.—no par	124	106	126
Consolidated Gas—no par	a 83½	74½	84½
Continental Gas & Electric	82	77	90
Electric Bond & Share Sec. Corp	a102	102	103½
Electric Power & Light	a 28	17½	29½
Federal Light and Traction	a163½	114½	168
General Gas & Electric	85	72	85
Lehigh Power Securities—no par	119	82	119
*Middle West Utilities—no par	89	82½	102½
National Power & Light—no par	295	185	295
North American—10	a 49½	41½	50½
Philadelphia Co.—50	a 57½	51½	59½
Power Securities—no par	12	...	...
Public Service Corp. of N. J.—no par	a 71	62½	72½
Standard Gas & Electric—no par	a 50½	40½	52½
United Gas & Electric (Conn.)—no par	31	26	37½
Utah Securities	a120½	41½	127½
BONDS			
Operating Companies			
Adirondack Power & Light	6s 1950	104½	102½ 105
Alabama Power	5s 1946	98½	96 99½
Appalachian Power	5s 1941	98½	96 99
Brooklyn Edison	5s 1949	101½	99½ 101½
	6s 1930	105½	104 105½
Cleveland Electric Illuminating	5s 1939	100½	100 101½
Commonwealth Edison	5s 1943	100½	99½ 101
	5s 1953	99½	98½ 99½
§Consol. Gas, Elec. Lt. & Pwr.	4½s 1935	97½	93½ 97½
	6s 1949	107½	104½ 107½
Consumers' Power	5s 1936	99½	99 100½
	5s 1952	96½	90½ 97
Detroit Edison	5s 1933	101	99½ 102½
Duquesne Light	6s 1949	105½	104½ 107
Great Western Power	5s 1946	97½	95 98½
Kansas City Power & Light	5s 1952	99	95½ 99½
Mississippi River Power	5s 1951	98½	96½ 99
Montana Power	5s 1943	99½	97½ 100½
New England Power	5s 1951	101½	100½ 102
New York Edison	6½s 1941	114½	112 115
Niagara Falls Power	6s 1932	105½	103½ 105½
Northern States Power	5s 1941	98	93 98
	6s 1941	104½	103 107½
Ohio Power	7s 1951	106½	106½ 107½
Pacific Gas & Electric	5s 1942	97½	93½ 97
Pennsylvania Water & Power	5s 1940	100½	99½ 101½
‡Philadelphia Electric	5s 1966	102½	100½ 102½
	5½s 1947	106	103½ 106
	6s 1941	107½	106 107½
Portland Electric Power	6s 1947	97½	96½ 97½
Southern California Edison	5s 1939	99½	99½ 101
	6s 1944	103½	102½ 104½
Tennessee Electric Power	6s 1947	100½	99½ 102½
Texas Power & Light	5s 1937	98	97 99
Toledo Edison	7s 1941	110	108½ 110½
Utah Power & Light	5s 1944	96½	91 96½
Holding Companies			
Alabama Traction, Light & Power	5s 1962	91½	86 92
American Gas & Electric	6s 2014	96½	96½ 97
American Power & Light	6s 2016	95	94 95½
Amer. Water Works & Electric	5s 1934	95½	92½ 96½
Associated Gas & Electric	6½s 1954	a101½	... ...
Central Indiana Power	6s 1947	98	95½ 98½
Commonwealth Power	6s 1947	100	97½ 101½
Consolidated Cities Lt., Pwr. & Tr.	5s 1962	79½	75½ 80½
Illinois Power & Light	6s 1953	100½	100½ 102
United Light & Railways	5s 1932	95½	93½ 96½
	6s 1952	98	95½ 99½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing		107	90 107
*National Carbon		124	120 124
Worthington Pump & Machinery A		a81	68 89½
COMMON STOCKS			
Allis-Chalmers Manufacturing		a 80½	71½ 86½
American Bosch Magneto—no par		a 32½	26½ 54½
Electric Storage Battery—no par		a 63½	60½ 70½
General Electric		a281½	227½ 320
General Electric—10		a 111	11 111
*Hurley Machine—no par		48	41½ 56
†Wagner Electric		41½	26½ 50
Westinghouse Electric & Manufacturing—50		a 71½	66½ 84
Worthington Pump & Machinery		a 42½	40½ 79½
BONDS			
General Electric	3½s 1942	85½	83 85½
	5s 1952	105½	101½ 105½
Robbins & Myers	7s 1952	66	64½ 73½
Western Electric	5s 1944	100½	98 100½
Westinghouse Electric & Mfg.	7s 1931	107½	106½ 108½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price, low and high, Tuesday, May 12.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

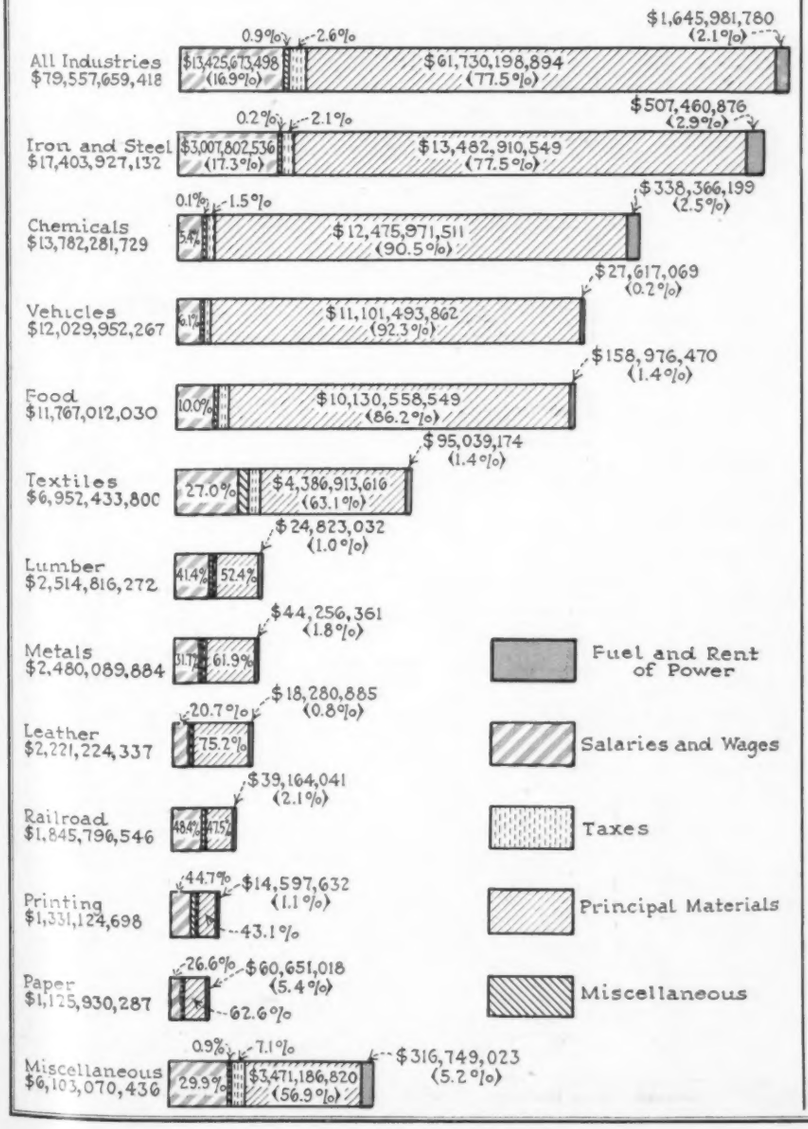
Specializing in Industry

AMONG the attributes which distinguish American industry from that of other nations are those of mass production and specialization. In America the manufacturer takes hold of things in a big way, studies the best and most efficient ways of producing one kind of merchandise, and sticks to that one thing and its related or derivative products. The jack-of-all-trades has no place in the industrial world of this country.

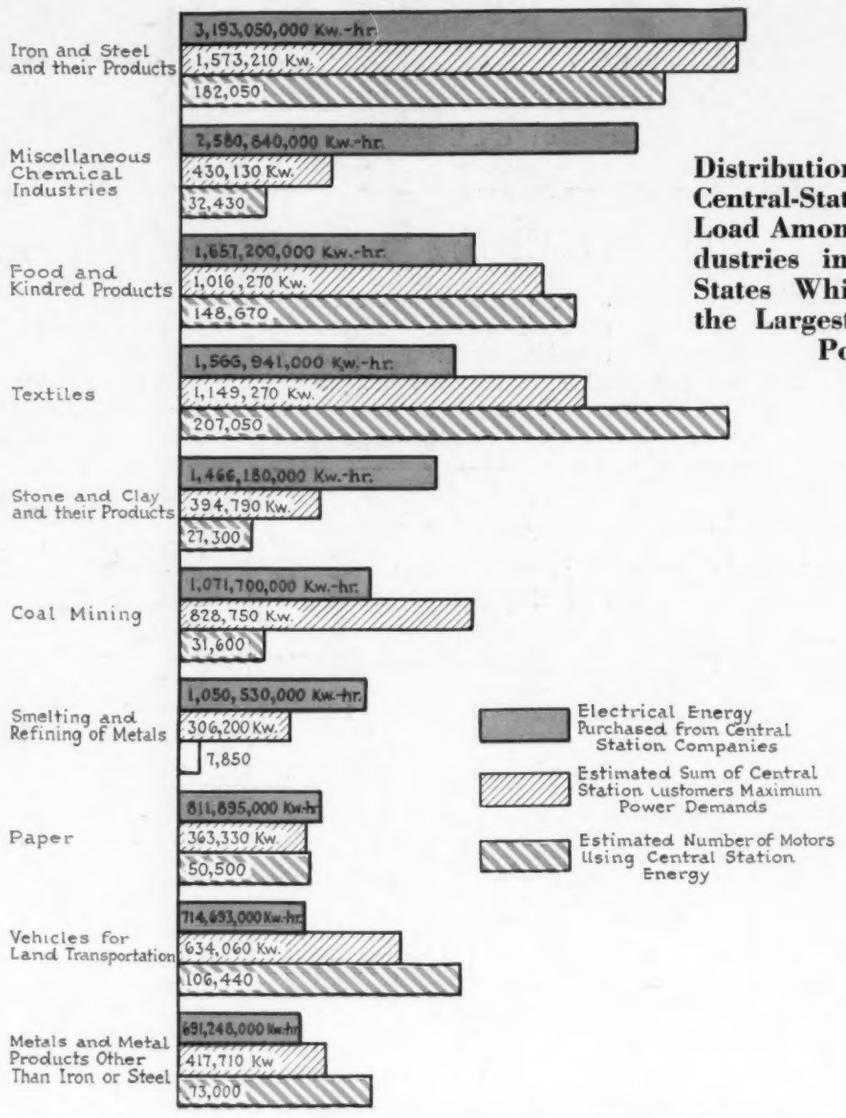
Yet almost twenty-five thousand manufacturing companies in this country still insist on maintaining a power house as an adjunct to their business. These private power plants with their comparatively small production call for a special department of one or more trained men, special purchases of fuel and engineering supplies and valuable space in the factory. The manufacturing executive finds the plants a source of continual irritation which is entirely out of proportion to their importance, as is indicated by the sum apportioned for fuel and power in the manufacturing budget—only 2.1 per cent of the total expense budget in the average factory.

Today the private power plant is in no way a necessity except in special instances. The power lines of the local electric light and power company pass by the door of the plant, ready to supply all the power which the factory needs at less cost and in a more reliable manner than is possible from privately operated plants. The wide-awake manufacturing executive will grasp this chance of delegating to the central station the task of producing the small amount of power which his factory may need, thereby entirely unloading the responsibility for the continual production of power for his factory. He thereby calls to his aid the services of a specialist.

The Amount Paid for Power by the Average Manufacturing Plant Occupies a Small Place in the Budget of Expenses



Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.



Distribution of the 1923 Central-Station Power Load Among the Ten Industries in the United States Which Consume the Largest Amount of Power

Future of the Industrial Power Load

THE avidity with which American industry has adopted electrical energy as a form of motive power has contributed very largely to the stupendous growth in the activities of the electric light and power industry during the past decade. It took a world war to bring home fully to man the advantages of electrical energy as a source of industrial power, but when that idea did take hold the central station witnessed a growth in energy sales which resulted in a doubling of the output in less than six years. Today finds the central station tied in with industrial activities to such an extent that if for some unforeseen reason it should cease operations complete industrial chaos would result.

Notwithstanding the great increase made in the power load of the central station during the past decade, the future still holds large possibilities for growth. New and unthought-of industrial applications make available a potential central-station field the size of which causes the present development of the industry to seem like a mere beginning. The industrial heating load alone holds possibilities estimated at seventy-five million kilowatts, a load equal to three times the present total connected industrial power load of the electric light and power industry. Large fields for central-station growth are also possible through the gradual elimination of private generating plants which now generate over fourteen billion kilowatt-hours per annum. At the present time only approximately 65 per cent of industry is electrified, so that the central station has large load possibilities in this as yet untouched field.

The electric light and power industry has recorded a marvelous growth in the past, but many decades will pass before the maximum use of electrical power by industry will be witnessed.